THE LARGEST MODEL HOBBY MAGAZINE IN THE WORLD

U.S. ONE DOLLAR / U.K. 60p JULY 1974

AMERICAN aircraft modeler

INCLUDING THE OFFICIAL NEWS OF THE ACADEMY OF MODEL AERONAUTICS

Beginners Control

SCIENTIFIC

Look like real planes!

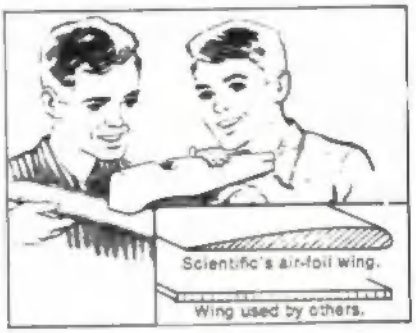
Perfect for control-line beginners

solid balsa construction withstands hard landings time after time

Scientific Beginner Models are better than profiles...here's why:

Most profile models have a plain, flat wing. Scientific's full-fuselage models have an extra-lift, one piece *air-foiled* solid balsa wing. Gives extra lift: makes flying and difficult maneuvers easy.

Scientific models have an exclusive pre-carved balsa body (not just a thin sheet of wood) which gives you a sturdier more realistic flying model.



You also get these other features:

- **Extra-strength plywood motor mount**
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- **Plastic engine cowling, canopy and windshield (on most models)**
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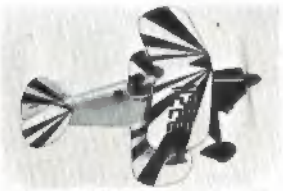
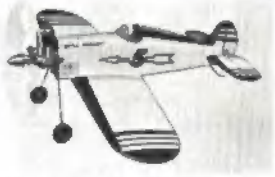


Kit 20 **LITTLE STINKER**, 18". Popular aerobatic speedster.



Kit 25 **LITTLE MERCURY**, 18". Easy to build and fly.

Kit 70 **F-51 MUSTANG**, 21". Famous WW II fighter.

Kit 72 **SUPER STUNTMASTER** 20". A built-up wing stunt sensation.

Kit 74 **MESSERSCHMITT ME-109**, 18". German WW II fighter.

HERE'S THE COUNTRY'S HOTTEST

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YOU FLY IT A MILE . . . with truly amazing performance like you never thought possible. Big deluxe kit includes Hi-Thrust Propeller, Formed Leading and Trailing Edges, Formed Wire Parts, Pure Contest Rubber Drive, Colorful Decals and Full Size (44") Easy to Follow Plans.

$5.49

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SEE YOUR DEALER. If kits are not available at dealer, you may order direct from factory adding $1.00 for postage and handling. Outside U.S.A. add $2.00.

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Fly like real planes!

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21 popular models to choose from:

$5.49 each

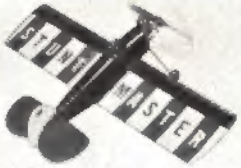
P-40 FLYING TIGER
Kit #59. Famous World War II Fighter with 18" wingspan. Looks and flys like the real plane.

Photos of actual models

Kit 60 **STUKA DIVE BOMBER** 18" Scale model of W.W. II fighter

Kit 55 **PIPER CUB TRAINER** 18" Famous private trainer

Kit 48 **GOLDEN HAWK** 18". A great model for fun flying



Kit 25 **STUNT MASTER** 18" One of America's most popular stunt models.

Kit 30 **RED DEVIL** 18" Great training model for beginners

Kit 6 **CESSNA BIRD DOG** 18" Scale model U. S. "Flying Jeep"

Kit 54 **CESSNA "182" TRI-CYCLE** High performance private plane

Kit 14 **PIPER TRI-PACER** 18" with popular tri-cycle landing gear

Kit 28 **LITTLE DEVIL** 18" Fast, easy to fly, great performer

Kit 7 **CESSNA "180"** 18" Model has good looks, great speed

Kit 53 **RED FLASH** 18" Model has sleek looks, good control

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Kit 65 **ZIG ZAG** 18" A stunt sensation, great looks too

Kit 15 **LITTLE MUSTANG** 18" Fast easy to fly semi-scale model

Kit 29 **LITTLE RIPE** Big 70 sq. in. wing area, 2 preshaped wings

Send for our big colorful catalog . . . only 25¢

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AMERICAN
aircraft modeler
VOLUME 78, NUMBER 7 JULY 1974

COVER PHOTO

Photos by Eric Meyers are of Bob Violett's fabulous Sundowner. This "duct-fan" powered pattern/stand-off scale F-4 jet is featured on page 26 of this issue.

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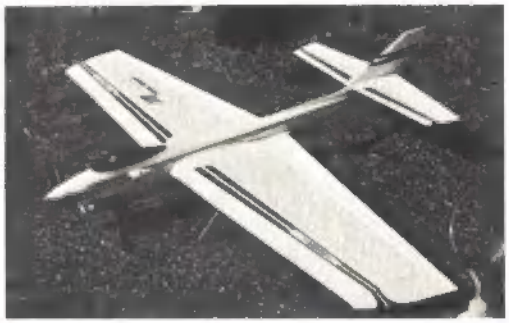

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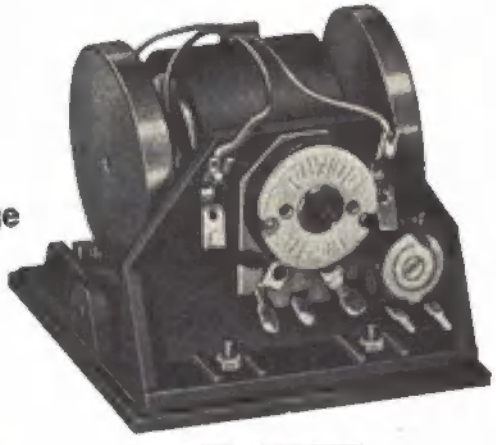

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GYROSCOPE

The KAVAN gyroscope connects tail rotor servo.

Prevents unwanted turns of fuselage as a result of torque, wind, etc.

Automatically adjusts tail rotor via servo.

A must for your first flights. For all helicopters.

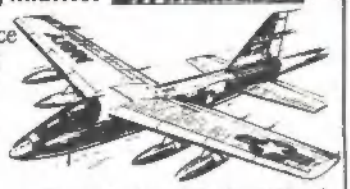
Contact: J & J. Simone, 26071 Via Viento, Mission Viejo, CA 92675 (714) 837-2676

KAVAN MODEL AIRCRAFT INC. 1424 E. ROBCHARD AVENUE, SANTA ANA, CA. 92705 (714) 836-7788

NEW! Midwest **Strikemaster**

List price $42.95

PRICE **$31.47**



55" span, sharp 4 channel plane that's a hot multi or aileron trainer.

Hand-held WINDMETER $5.95

Accurately measures wind speeds on two scales; 2-10 mph or 4-66 mph. With protective jacket. We tried out one of these in the tornados that blew through Brentwood last month and found that in a 187 mph wind, the windmeter and the operator both blow away.

BRAND NEW! VOLUME III

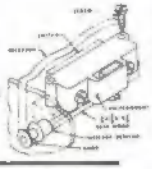
HOBBY LOBBY ILLUSTRATED CATALOG $2.00

MORE goodies, MORE photos, MORE of the LOWEST DELIVERED prices in the R/C Hobby!

NEW! ACCESSORIES

NEW Rocket City INTERNAL SWITCH MOUNT $1.29

Mounts the standard Noble digital propo airborne switch inside the airplane and does not require drilling the switch lever for installation of external switch push rod.

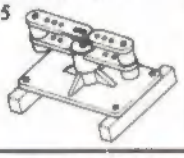


NEW E-K ANTENNA MOUNTING KIT (AMH-1) 49¢

Includes eyelet to relieve strain at receiver, fuselage exit bushing, fin mounted clip for antenna wire.

NEW E-K DUAL CONTROL MIXER (DCM-1) $2.95

Similar in principle to Airtronics Vector-Director, Kraft Elevon Linkage Kit. For V-tailed gliders or "flaperon" controls.

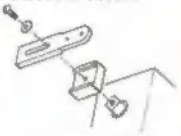


NEW E-K SWITCH MOUNTING BRACKET (SMB-1) 99¢

Mounts the standard Noble digital propo airborne switch inside the airplane and does not require drilling the switch lever for installation of external switch push rod.

NEW E-K ADJUSTABLE SERVO ARM FOR E-K SM SERVOS (ASA-1) 98¢

Also fits Hobby Lobby 3 servos, Hobby Lobby 4 and 5 servos.



NEW Semco EXHAUST EXTENSIONS $4.50 each

EM-201 for .15-.25 engine
EM-202 for .29-.40 engine
EM-203 for .45-.80 engine
2½" long. Use with the Semco adapter for your engine.

World Engines

EXPERT 5 CHANNEL DIGITAL PROPORTIONAL

List price $329.00

HOBBY LOBBY PRICE **$229.00**

EXPERT 7 CHANNEL DIGITAL PROPORTIONAL

List price $369.00

Hobby Lobby Price **$259.00**

The EXPERT digital Propos are World Engines new line of digitals that replace Blue Max and the WORLD systems. They come only in fully factory assembled form - there will be no kits or semi-kits. The EXPERT series use a brand new open gimbal control stick with electric trims.

R/C ON A BUDGET

Ace R/C PULSE PROPORTIONAL R/C SYSTEMS

Ace RC's single channel (rudder-only) pulse proportional RC systems give reliable and enjoyable control when installed in small gliders and small, stable RC powered planes such as Ace High glider, Goldberg Jr. Falcon, Competitions Kits' Eindecker, Midwest Li'l "T", Tern Aero's Super Starduster, Sig's RC Sport, Stinson and Relic.

If you've never seen a powered plane fly on rudder-only control you'll probably be surprised when you see it ROG, turn, barrel roll, loop, and glide into a spot landing. And, small gliders with these super lightweight systems in them fly like trained eagles.

Ace R/C System	Airborne Weight	Recommended for:	
"BABY"	2.5 oz.	Pee Wee .010 Up to 48" gliders	$59.95
"BABY TWIN"	2.7 oz.	Tee Dee .010-.020 Up to 72" gliders	$62.95
"STANDARD"	3.7 oz.	.049 to .10	$61.95
"STOMPER"	4.1 oz.	Tee Dee .049-.23	$64.95

All four above systems are identical except for the actuator used, and the capacity of the airborne batteries -- the two lightest systems use 225 mah. cells, and the two heaviest systems use 500 mah. cells (for longer flying time). You can inexpensively convert your system to one of the others by simply changing the inexpensive actuators and/or batteries (all components PLUG IN). Our recommendation for the most useful all-purpose systems are the "STANDARD" and "BABY"

SAVE $$ ON THESE MATCHED COMBINATIONS

(Prices in effect until July 15, 1974)

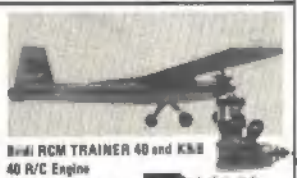
Ace ALL STAR BIPLANE 34" foam wings and Fox 15 R/C Engine
Total list value $42.90 PRICE **$30.00**

Lanier SPRINT 25 A-R-F and Fox 15 R/C Engine
Total list value $71.90 PRICE **$49.00**

Top Flite HEADMASTER and Fox 19 R/C Engine
Total list value $45.90 PRICE **$32.00**

Lanier COMET II A-R-F and Fox EAGLE 60 R/C Engine
Total list value $121.90 PRICE **$79.00**

Midwest (all foam) CESSNA CARDINAL A-R-F and Fox 15 R/C Engine
Total list value $45.90 PRICE **$31.00**



Bridi RCM TRAINER 40 and K&B 40 R/C Engine
Total list value $87.95 PRICE **$66.00**

Marks WINDFREE GLIDER and 2 rolls T/F SUPER-MONOKOTE
Total list value $56.15 PRICE **$38.00**

Bridi SUPER KAOS 40 and K&B 40 R/C Engine
Total list value $89.95 PRICE **$68.00**

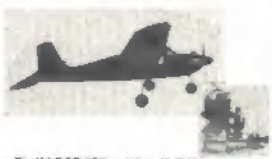
Marks WINDWARD GLIDER and 1 roll T/F SUPERMONOKOTE
Total list value $38.05 PRICE **$27.00**

Bridi RCM BASIC TRAINER and Fox 19 R/C Engine
Total list value $55.90 PRICE **$40.00**

CONTROL LINE COMBOS

Sterling RINGMASTER and Fox 35 Stunt Engine
Total list value $29.90 PRICE **$23.00**

Sterling RINGMASTER, JR. and Fox 15 Stunt Engine
Total list value $22.90 PRICE **$18.00**



Sig KADET 57" and Fox 19 R/C Engine
Total list value $59.90 PRICE **$41.00**

Sig KOMANDER 62" and K&B 40 R/C Engine
Total list value $77.50 PRICE **$61.00**

A BRAND NEW RC BOOK

"EVERYTHING YOU SHOULD KNOW ABOUT RADIO CONTROL FLYING"

or How to Get 1,000 Flights out of your RC Airplane $3.95

Illustrated instruction book tells how to avoid crashes, good practices to follow, how to trim a plane for flight. Written by a prominent former chronic crasher of RC airplanes.

TRY US OUT: W.M. did.

Recently I placed an order with you for a 12 volt starter. I would be remiss in my obligations if I didn't take a minute or two to thank you for your most prompt service. The manner in which my order was taken over the phone and the little personal touch "thanks from Debbie" on the face of the invoice is something that one doesn't find too often these days.
W.M., Wausau, Wisconsin

"Full-house" A-JUSTO-JIG List price $49.95 PRICE $39.97

This heavily made device is a jig for precise no-warp construction of wings up to 72" span. Jig can be rotated so you can work on wing from any angle. Includes fuselage jig for accurate construction of perfectly symmetrical fuselages.

DAE POWER PANEL

List price $18.95

HOBBY LOBBY PRICE $15.97

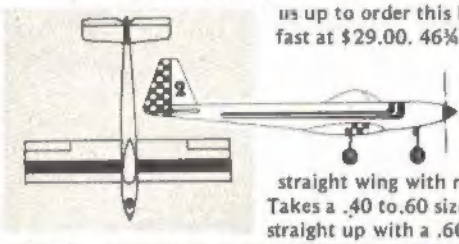
This 3"x 5" panel mounts on your field box and connects to a 12 volt battery to give you:

A. 12 volt outlet to electric starter,
B. 6 or 12 volts to electric fuel pump,
C. 1½ volts to glow plug,
D. Ammeter to check condition of glow plug,
E. Connectors, leads.

EXTRA SPECIAL! World Engines FUN-FLI Mk 1 Kit List price $44.95

EXTRA SPECIAL SALE PRICE..... $29.00

(limited quantity at this price) Here's a lot of kit for a silly low price. Call us up to order this because they'll sell out fast at $29.00. 46¾" wing span conventional balsa construction. THIS IS A VERY EASY KIT TO BUILD- full pre-cut ¼" thick fuselage sides, simple straight wing with nicely bandsawed ribs. Takes a .40 to.60 size engine - - goes straight up with a .60.



NEW! AHM "KWIK - KOTE"

List price $7.98 roll
Hobby Lobby Price **$4.66** roll

Kwik-Kote OPAQUE colors:
No. 9301 Dark Red
No. 9302 Orange
No. 9303 Yellow
No. 9304 White
No. 9306 Sky Blue
No. 9307 Silver
No. 9308 Black
No. 9315 Purple
No. 9316 Light Red

Kwik-Kote TRANS-PARENT Colors
No. 9331 Trans. Red
No. 9332 Trans. Orange
No. 9333 Trans. Yellow
No. 9334 Trans. Blue

This is a heat shrink model covering material that is very similar to Pactra's Solar film. With Solarfilm practically unavailable we tried out Kwik-Kote and found that it has the same ability to shrink on rather low heat, but resists burning better.

Kwik-Kote comes in a slightly larger size roll 26" x 78" giving 156 square inches more material for the money.

Notice that the transparent colors sell for the same price as opaques.

DREMEL MOTO-TOOL MOTO-SHOP SALE

(MOTO-TOOL KITS include moto-tool, carrying case, high speed cutters, grinding wheels, polishing tips, chuck collets, etc.) (Prices in effect until July 15, 1974)

MODEL 261 MOTO-TOOL KIT

List price $37.95
PRICE **$27.97**

The standard Moto-Tool. .5 amp motor, bronze bearings.

MODEL 271 MOTO-TOOL KIT

List price $39.95
PRICE **$29.97**

Larger, more powerful Moto-Tool. .8 amp motor, bronze bearings.

MODEL 281 MOTO-TOOL KIT

List price $49.95
PRICE **$36.97**

Heavy duty industrial type. .8 amp motor, ball bearings.

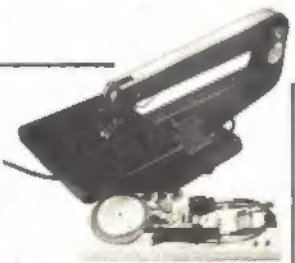
MODEL 381 MOTO-TOOL KIT

List price $59.95
PRICE **$44.97**

Same heavy duty features as 281, but has variable speed control.

MODEL 572 Deluxe MOTO-SHOP with ACCESSORY KIT.

List price $64.75
PRICE **$48.97**



The most useful power tool for a model airplane hobbyist. It's five tools in one: (1) Jig Saw, (2) Disc sander, (3) Buffing wheel, (4) Bench grinder, (5) Flexible shaft tool for drilling, carving and routing.

"HOBBY LOBBY 5 COUNTRY"

The Columbus-Fort Benning (Georgia) R/C Flyers club is one of the most active R/C clubs in the Southeast. The photo shows the group after their March 17 Fun Fly. Front row: *Leo Lewis, Sr., Tommy Wade, Berney Dickson, Al Algood, Leo Lewis, Jr., Charlie Duke, Dave Wright.* Back row: *Charles Howard, Ron Roberts, Jim Barden, Mike Delaurenyi, Bill Mitchell, Mike Disser, Tommy Mitchell, Bill Wade.*

This photo really tickled us because those radios in front of the airplanes are nearly all Hobby Lobby 5's. There's one "vintage" model Hobby Lobby 4 on the right - - it must be about four years old.

Here's Dr. Elmo Dooley of Cookeville, Tenn. with his new Wayfarer Bipe and his Hobby Lobby 5 radio. The way Doc Dooley (he's a professor at Tennessee Tech) builds a plane is discouraging to a hacker like me.

I offered to test fly the plane for him, but he declined.

HOBBY LOBBY INTERNATIONAL

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Phone 615/834-2323 Store Hours: 9 a.m. - 5 p.m. except Sundays.

Modeler Mail

Keep It Up!

You have created a model airplane magazine that treats its readers like adults. Finally. It is a pleasure to read a magazine about this hobby that is neither condescending nor unaware of changes in attitude and life-style of the typical modeler. To see cover photos that don't suggest that all the readership cares about is bikinis and shiny machinery, is a change definitely for the better. To see real humor on the cover (May '74) is an absolute breakthrough.

I have been surprised and impressed by the consistent quality and depth of each issue. You also keep a reasonable distance from the advertisers. Most readers understand the symbiotic relationship between trade and magazines, but some publications go too far.

I wish you the best for future issues. Keep it up!

Tony Loomis
Geneva, Ill.

Bedish + Bug = Good

You sure know how to make a guy feel good—with Gabriel Bedish's revisitation of the ole' Rudder Bug.

The Bedish modernization appears to be both aesthetic and functional from the excellent photos, but I'm struck by the emphasis on the largeness of the Royal Rudder Bug. The original Rudder Bug had a six-foot span (the Royal RB is five ft.), and was introduced in 1949 as a drastic reduction from the eight-foot monsters that were common then. The Royal was a further reduction carried out mostly by Don Clark, with the intent of moving the wing from the front cabin of his car into the trunk. So, maybe the Royal Rudder Bug is large by today's standards, but it was really small in relation to the models of its own age.

I'm delighted that Bedish has received so much pleasure from the Bug, and I hope that many others will too. The Bug was certainly one of my special favorites.

Thanks again for making my day with that beautiful centerfold of the ole' Rudder Bug. It brought back many pleasant memories.

Walt Good
Heidelberg, W. Germany

Helpful Household Hint

Having not been into model building for about twenty years, there are many new products and procedures which are new to me. One of these was the low temperature mylar coverings, which I used to cover my first and current radio control plane. Use a paper towel between the iron and covering material. I was having trouble with the film sticking to the iron (household), and tried this in desperation. It worked very well for me, and might for others who have the same trouble.

You have an excellent magazine, keep it up.

C. J. Corbin
Tarkio, Mo.

Do not try this with the higher temperature iron-on coverings; however, a piece of linen works well. Or, for a super scratch-free finish, use a hot air gun and clean cloth.

—Editor

Postscript to P.R.E.

Regarding your product report on the Polish Racing Engine, this engine was originally designed by "Polish Bob" Chavaznitz in late 1952, and was a direct result of his dissatisfaction with the overrated G.H.Q. Bob and I served together in the underground, and in 1954 he sent me the second prototype designated PRE-100K-60 which is, as near as I can tell from your specs, identical to the one you tested, except that my muffler is shorter and will only accommodate "regular" cigarettes.

Even though I have over 700 hours on it, I was able to reproduce your test result with my PRE. This was only an academic exercise on my part, since it was apparent you had not received (or just had not read) the instructions. Properly set up, this engine is fantastic.

The reason the mounting holes are undrilled is because they are not mounting lugs. They are a manufacturing expedient to allow firm positioning of the case in the automated production machines. This results in the close tolerances you observed. The proper way to mount this engine is to bolt the crankshaft directly to the firewall (where you have the propeller in the photograph) on the desired thrust line. This is, as you noted, a racing engine. A special one-blade propeller is bolted to the front of the case with four screws. (These are similar to the backplate screws on conventional engines). The cylinder head itself serves as the counterweight, and the whole assembly turns, a la Le Rhone. "Polish Bob" hand carves a special one-blade propeller from a block of Linear Boron filaments bonded with cyano-acrilate epoxy. This one blade is 8.754" long (shaft line to tip) and has a 12" pitch. Bob is left-handed and for ease in starting he made his engine a left-handed engine. You were actually running it backwards and getting remarkable performance for a shaft valved engine.

(Continued on page 89)

papi
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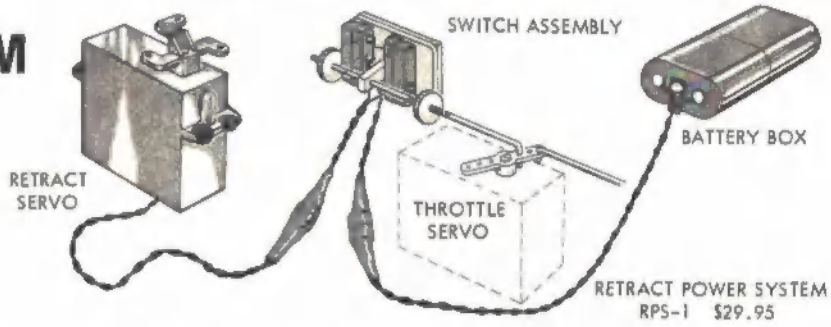

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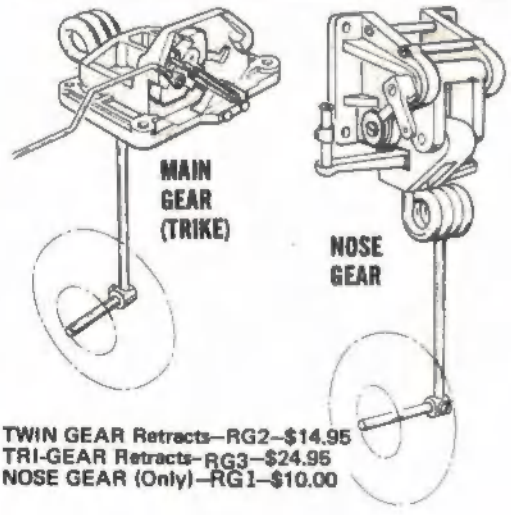

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Modeler's Bookshelf

FLYING THE OLD PLANES
by Frank Tallman
255 Pages; Illustrated
Doubleday & Co.

Doing many things well is a lot to expect of a book—or anything else for that matter. But here's one deserving of shelf space for several good reasons. First, Frank Tallman's text meets the basic requirement of providing a lot of good, old-fashioned enjoyment to anyone interested in planes and flying, either armchair or aircraft.

Then, because it's a peculiar combination of old and new, *Flying the Old Planes* has immense value to scale designers and builders. If you've ever puzzled over a third or fourth generation photo, trying to pick detail from what some mechanic caught on a grey day with 1914's version of the Brownie, these illustrations will be sheer delight. The planes may be old, but the photographic equipment used was strictly modern, and the men behind it pros. So the flight studies, close-ups and shots of aircraft under construction and reconstruction are a prime source of the way things should look. There are well over a hundred, too, both black and white, and color.

As a bonus, Tallman details the tricky flight characteristics of some of the planes. Since the tendency he reports of a DR-1's lower-wing turbulence to stall out the tail surfaces on landing, or the nasty effect of torque on takeoff in the short-bodied E Model P-40's, are as real in models as they are on full-sized planes, these hints are a help to any pilot, even one who stays on the ground when he flies.

The 25 aircraft in the book pretty well span aviation's prop-driven phase, starting with the Bleriot of its infancy and ending with the sophisticated WWII machinery. Of particular interest are the planes of what this reviewer feels were the Golden Years—the 30s. Al William's Gulf Hawk. . .Lockheed's Vega. . .the Boeing P-12—how well I remember fighting the compound fuselage curves of those beauties as I tried to cover my latest ten cent (!) kit.

Flying the Old Planes is fun to read and full of photos, facts and nostalgia. These days that's a lot for $14.95.

AIRCRAFT IN PROFILE

With the recent appearance of Volumes 12 and 13, the handy series, *Aircraft in Profile*, is now of even greater value to the scale buff. They're available now, edited by Charles W. Cain and published by Doubleday. $9.95 each.

Editorial

sport modeler

With this issue of **AAM** we also introduce the first issue of Potomac Aviations Publications' new magazine, **Sport Modeler**. As you read this, the first issue is coming off the presses. . .it is available right now. Through the rest of 1974, **Sport Modeler** will be a bimonthly magazine; then it goes monthly in 1975. It replaces our **Junior American Modeler** magazine.

If you are a casual modeler, competition flier with a modeling family, or a sport flier yourself, we are confident you'll like **SM**. This new magazine will be the non-technical magazine of model aviation. We'll keep things uncomplicated. We think that most sport modelers build and fly kits. Whether it's CL, FF, or RC, our emphasis will be on kits, construction methods, how to fly, how to build, and how to get the most from your plane.

Sport Modeler's Editor is Bill Winter. You all know Bill, he has been around model aviation since the Tri-motor first flew. Bill has been **AAM**'s Editor as recently as five years ago, and he created and edited the **Junior American Modeler**. **Sport Modeler** will be full of fun things to build, and loaded with RC for the beginner and and intermediate flier. With Bill's experience and talent, you can be assured that **Sport Modeler** will always be a well-balanced model publication.

What does the title **Sport Modeler** mean to you? I'll bet that you will find your concept to be well covered in the magazine. There's an easy way to find out—subscribe! You can also find **Sport Modeler** at your favorite hobby shop. *Or* you can write me a personal letter, with ideas about what you hope to find in **SM**, and I'll mail you one of these bimonthly issues, free. This offer expires in October when we will be producing the first monthly issues. By then you just might be a subscriber to **SM**. One free copy per letter/family up to the first 5000 only.

Y'ALL COME!

This year, the greatest aviation spectacular, the AMA National Championships, will be held in the very beautiful state of Louisiana. The site will be the former Chennault Air Force Base, now owned by the city of Lake Charles. The NATS will be nearly two weeks long, with every possible type of model aircraft being flown in competition. The dates are August 4-15. We really hope that you, our readers, will be able to attend the event, if not as a competitor, then as a spectator.

Really, have you seen an indoor model fly (watching your plane fall off the building table doesn't count)? Can you imagine models flying at the full speed of a turtle? How about RC Pylon Racing, where the planes are doing 150 to 180 mph—four at a time? Ever watched a lazy, thermaling, free flight rubber or gas model? Perhaps you have never seen the excitement of CL Navy Carrier! How about the absolute beauty of a well-flown CL aerobatic schedule? There will also be some RC Helicopter events, RC Thermal Soaring, CL Speed (like 200 mph), and many fantastic Scale events in all categories.

Last year, many of you were disappointed at the Oshkosh NATS, because of gate admission charges and the inaccessability of the model flying areas. This year, you will find the AMA ready and able to accommodate spectators, with parking on site, and excellent facilities for viewing all the action. There will be no gate admission charge. If you want to get right on the flight line, for very close viewing or photography, you can become a one-week AMA Member/Mechanic for a small fee. Why not join this super organization for the full year at Lake Charles? As a member, you receive **American Aircraft Modeler**, with the official AMA News section in each issue. You'll get complete and immediate coverage of the NATS in both **AAM** and the AMA Section (just in case you miss anything while you're there).

For the full schedule of the AMA NATS, please refer to page 100 of the June **AAM**. A full contest calendar is there, plus other information which will help make your NATS trip a great experience. In addition to the scheduled events, there will be many unofficial model activities flown, as described in the AMA copy.

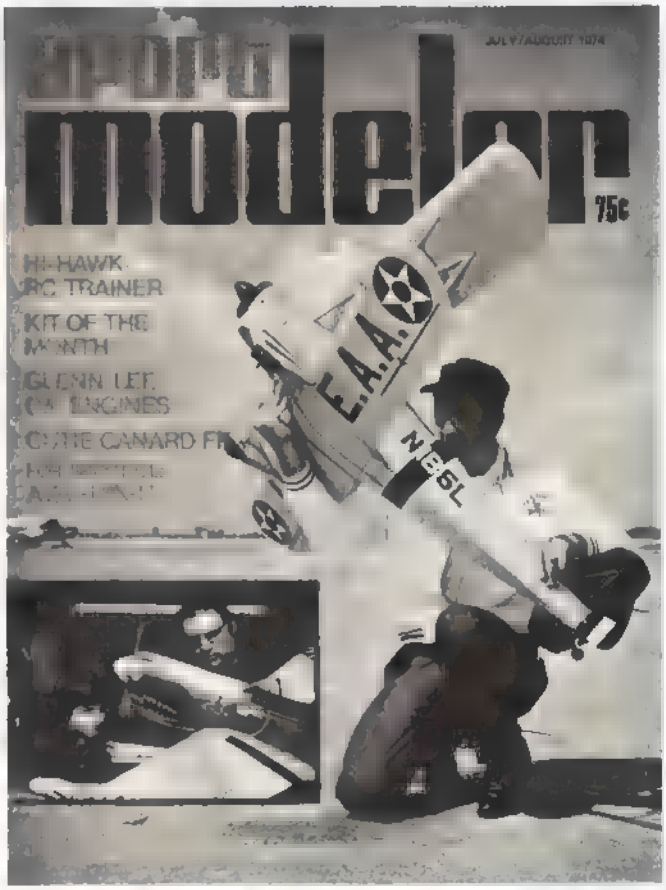
Now is the time to plan your summer vacation, so come to Lake Charles. You will also find many non-modeling recreations nearby. Come in a camper—there are places to park and hook-up. Motels dot the area by the dozens, too. The Interstate highway system goes right through town. Bring light clothing and a bathing suit.

For the fun of it...

If you build and fly model airplanes for the fun of it **SPORT MODELER** magazine is for you. Each issue is written to help your modeling to be easier, more original, more interesting and more fun. At last a magazine written for the sport modeler.

Sport Modeler features:

- Original sport designs and plans
- How to do it building tips
- Informative detailed construction articles
- New product information
- Reviews of outstanding sport kits
- Future articles will explore engines, radios, covering, flying and much more



Order today so you don't miss a single issue. Send the attached order card to **SPORT MODELER MAGAZINE**, 733 Fifteenth Street, Washington, D.C. 20005

SPORT MODELER is the new name and concept for Junior American Modeler magazine. If you now have a subscription to Junior American Modeler you will recieve **SPORT MODELER** starting with the July / August issue. **SPORT MODELER** will be published bimonthly in 1974 and monthly starting in 1975.

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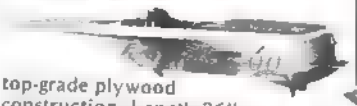

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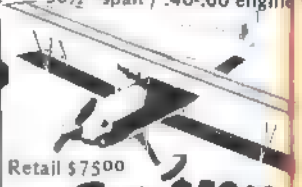

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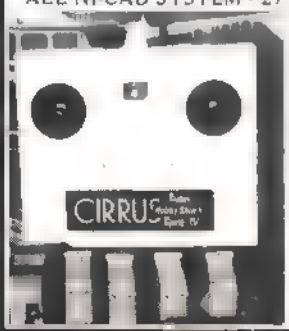

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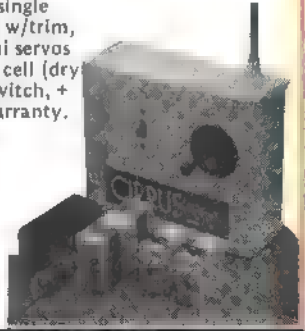

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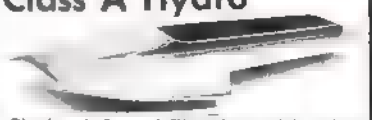

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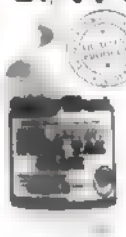

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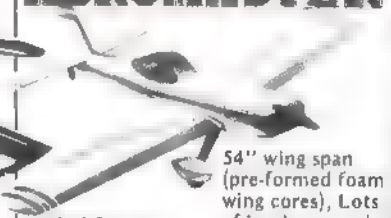

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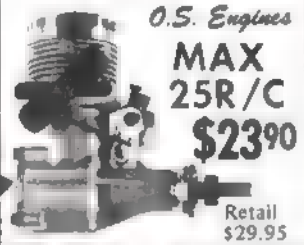

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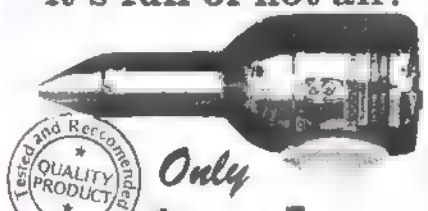

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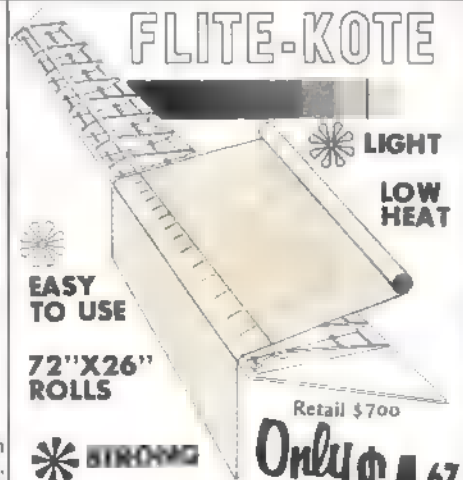

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Those Magnificent Young Cons and Their Flying Machines

STONE WALLS DO NOT A PRISON MAKE,
NOR IRON BARS A CAGE. . . .
by Don Nivens

It started one windy night when pal Oliver lofted a homemade kite over Black Mountain in Sonoma County, California.

I was working on the camp payroll when Ollie's "psssst" got my attention: "Loan me a cone of string," he whispered.

I gave him a roll of coarse packaging yarn and he disappeared into the mountain dusk. Fifteen minutes later he was back. "Gimme another roll," he pleaded. "Quick."

"What's going on?" I asked.

"C'mere and look."

We walked out onto the porch. Oliver pointed toward the clouds. High above the compound, ■ light bobbed in the windy darkness like ■ distant buoy. A great loop of knotted cord angled toward a kite with a flashlight in its rigging.

"Built it myself," said Ollie as he knotted on more string. "Bet a guy I could get it up a 1000 yards."

Now this particular exhibition wasn't especially noteworthy except that the pilot, and his audience of 50 men (including myself), were all inmates of a minimum security prison firefighting camp. Kite flying was definitely not one of the "approved" recreational activities, which usually tended toward wood carving and lamp making.

For that reason, Ollie had hoped to make the 1000-foot ascent in secrecy. Unfortunately, the obstinate coastal winds failed to cooperate and the vessel descended into the camp's short wave antennae system, the telephone lines and a television mast. The kite itself, a huge unretrievable blotch of evidence, snagged in the compound's tallest redwood, where it flapped like ■ flag of surrender.

The next morning, Camp Commander H. R. Oldham held a general forum. "What," he asked, coming straight to the point, "is a kite doing up in that tree?"

The rest of us sort of looked at the floor, or out the window, and shuffled around. After ■ silent pause, Ollie stood up, swallowed, and admitted that he had built and flown the kite.

"Hmmp," grunted Lt. Oldham, ■ grizzled old World War II veteran. "Hmmp," he repeated, and glared at Ollie. "Well," he said at last, "don't just sit there. Go get the damn thing down, and bring me back my flashlight."

Oldham declined any disciplinary action (nothing in the Department of Corrections' rule book covers kite flying anyhow) and, indeed, commended Ollie for his resourcefulness. He concluded the forum by suggesting that future craft launched from Black Mountain be maintained under slightly better control.

We immediately interpreted his reference to "future craft" as approval for flying machines in general.

At any rate, controlled model aircraft were swiftly introduced to the forestry camp. As if to underline Lt. Oldham's semi-official approval, Officer J.W. Bauer brought in our first airplane—a Cox prefabricated Stuka, equipped with ■ 049 engine. The plane was brand-new, and was to have been a birthday gift to Bauer's young son. Bauer admitted that he had never flown ■ control line model, but agreed to let anyone pilot it who could. Our lanky chain saw operator said that he had "had some experience in high school."

So, we had our plane and an "experienced pilot." All we needed now was the cooperation of the weather. It rains about 125 inches a year in the Black Mountain area, and the quota was just beginning to be filled about the time Bauer brought up the Stuka.

Our big day came the following Sunday. The rain stopped, the wind gentled. We gathered on ■ expanse of asphalt which divided the camp. There was a grassy island in the center, bordered by ■ low stone wall. Not exactly ideal for control line flying, but it was the best field we had, and once the wall was cleared there would be no problem, except for landing.

We gathered beyond the wall to witness the first powered flight ever launched from a prison camp. It was Kitty Hawk West and Cape Kennedy all at once. Even Lt. Oldham drove back into camp on feigned "business" to observe.

When the slim chain saw operator walked out and picked up the control handle, the assembled bunch of convicts broke into loud cheers and hoots. Convicts have an uncanny sense of imminent disaster.

Ollie, whom by now we were calling "Orville," was acting as pitman. He and Officer Bauer got the 049 started, and leaned it out to a beautiful hum. The youngster clutched the control handle in his fist, as a nervous parachutist would grip a ripcord. He didn't look as confident as he had when he'd volunteered for the mission. The reason, as we would later learn, was that the only plane he'd ever flown had been powered by rubber bands.

Anyhow, he gave the thumbs-up signal, and Ollie released the straining airplane. The Stuka raced over the asphalt in its takeoff arc—a silver-black streak. Ten feet from the rock wall, it lifted off the pavement and gained ■ altitude of approximately 2½ feet. It disintegrated beautifully upon impact, hitting the stone barrier dead center. The audience roared, rolled on the ground, applauded and cheered the stunned kid. Officer Bauer looked grimly at the pile of wreckage that was to have been his son's birthday present, and Lt. Oldham apparently had finished his business, because he went out to his car and drove off.

The engine somehow survived the crash and was salvaged, and next week it

was the power plant of a homemade flying wing. A former Hell's Angel, named Big John, had seen the wing in an issue of *Popular Mechanics*, and built it from literal scratch and scrap.

Big John's first flight drew the same enthusiastic audience of convicts. They displayed somewhat more respect to Big John, even though the transition from Harley-Davidson chopper to a flying wing was slightly ridiculous.

John's wing left the pit so fast that it was invisible, until it, too, smashed against Nemisis wall. Pieces of the engine were picked up a hundred yards away, and it looked as if the Black Mountain Air Force was dead.

However, Officer D.L. Johnson, a private pilot himself, and sort of unofficial hobby manager, sensed something of the enthusiasm for model flying among the inmates, and donated a Cox PT-19 Trainer to the camp. Its breakaway assembly, he felt, would assure at least ■ couple of rough flights before demolition.

I was elected to fly the thing, while Ollie and Big John would station themselves at the rock barrier, in an attempt to stop the plane should it appear unable to clear the wall. How they proposed to do this is rather vague, as most models are moving about 40 mph at takeoff.

On the appointed day, the PT-19 started easily and we leaned the engine to an even buzz. I glanced at the fatal wall a few yards away, swallowed, and nodded to old reliable Ollie. He trotted over from his catcher's position against the wall and yelled in my ear, "Back is up, and forward is down." He was referring to the control handle. "Okay," I said. He ran back over to the wall, where Big John was crouched ready to smother the plane like a live grenade should it appear endangered by the barrier.

My pitman released the plane, and it bounced slowly over the blacktop—too slowly, I knew, but gradually it picked up speed, the tail skid lifted and I heard a sickening sound like a dentist's drill as the prop sliced against the asphalt. There was no damage though and the PT-19 continued to race toward Big John and Ollie—and the wall. At the last possible instant, I yanked back on the control handle. My two crewmen who had sworn to "catch" the plane hurled themselves prone on the ground as the little trainer hurtled the barrier. Mt. Everest had been conquered.

I had forgotten that the controls were in my hand, as I admired the blue and yellow bird sailing up roof-high. Then I heard Ollie yell: "Down! Down!"

The PT-19 was struggling at the ragged edge of a stall. Before I could correct (as if I knew how), the plane flipped over in ■ sluggish loop and started down in ■ slack-line dive.

"Scratch another plane," I thought.

"Up! Full up" yelled Ollie. I hauled back on the handle, felt the jolt of tension on the lines and shut my eyes. There were cheers. When I opened my eyes, the PT-19 was still airborne, although there were some flowers stuck in her undercarrige—sort of a victory wreath for one complete airborne lap: a Black Mountain record. Then ten laps, fifteen. I concentrated on just keeping it level, face high. At 20 laps, I was dizzy and staggering, and the tiny engine sounded as if it would run the rest of the day. It was as if the plane and I were standing still, and the crowd was revolving around us. I tried to motion to Ollie, but couldn't find him in the carousel blur. Then the engine stopped. Reflex caused me to pull back on the control, and the trainer dropped like ■ basketball on a string. But good old Ollie raced out and caught it like a falling baby.

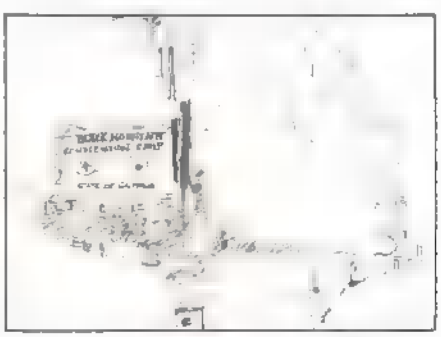
That night, a dozen orders for PT-19s were sent down to the hobby shop in Santa Rosa.

What made the Black Mountain Prop Busters (as we called our flying club) unique was not what he had, but what we didn't have. Materials were almost impossible to get; there were restrictions on glue and fuel. We had inferior batteries, or none at all; leaking homemade gas tanks and no gas. Above all, we had little money. But ■■ managed to get batteries from sympathetic forestry foremen. Officer Johnson worked out an arrangement with the hobby shop for discount prices, and, with major sacrifices in our canteen purchases, we finally had eight airplanes in the Black Mountain fleet. As the original PT-19s were smashed beyond repair on training flights, parts were salvaged.

We began building larger aircraft of the 35 class, and flew them over gullies and patches of tangled brush, trusting our developing skill and audacity to land them on a 12-foot strip we'd cleared in a canyon below the camp.

Big John continued his experiments ■■ the flying wing, and finally came up

(Continued on page 85)



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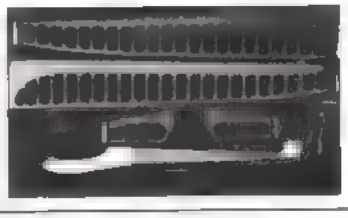

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TERN

Take a turn with the Tern. A stiletto silhouette of aerial majesty whispers across the slope face.

A tern is not only a slender-bodied gull, but also any threefold or triple thing. This Tern resembles ■ streamlined gull, and offers top performance dividends by using three functions. Make three your lucky number with a Tern. / by Ralph Grose

Model sailplanes have been judged, for the most part, by their ability to sustain optimum duration in marginal lift. As a result, most of the popular sailplanes feature low wing loading (which permits low speed and a short turning radius) to stay in the smaller thermals. The Tern represents an effort to design ■ sailplane geared to average lift conditions. This results in marked improvement in glide ratio, speed, penetration and control.

It is my belief that the similarity between models and full-scale high performance sailplanes needn't be limited to appearance, but can be extended to the flight characteristics as well. The Tern is a step in that direction. It presents a more realistic flight mode.

The single quality that improves all aspects of sailplane performance is low drag. With that in mind, drag reduction was a prime target for this design. The aspect ratio, concealed control horns, tail configuration, high wing loading, balsa wing skins, etc., were choices made to this end. In all cases, where ■ significant reduction in drag could be made, but additional weight was required to do so, the weight was added without hesitation.

Minimizing the model's weight was an objective, only to the extent that it would allow a wide lattitude in performance, by adding or removing ballast. Within limits, extra weight does not reduce the glide ratio. Weight is the glider's only source of motive power. If it doesn't have enough, it is underpowered. If it had none at all, it would float like a balloon.

Weight does increase the speed and, at a given glide ratio, the faster you go, the faster you are sinking. However, the Tern has ■ high glide ratio, as compared with existing designs, so the actual increase in sink rate is relatively small. As to what the glide ratio is, I don't know. A sensible calculation would require more information about its parasite drag.

While overall weight did not dictate design choices (except for strength reasons), weight distribution did. Weight, at ■ distance from the CG (such as outboard on the wing), causes inertia problems. It makes rotation about the vertical and longitudinal axes (yaw and roll) difficult to start and hard to stop. This is why a long glider wing needs to be tapered, and the spar needs to be tapered, or stepped.

The wing section was selected primarily for speed. At an all-up weight of six lb., the wing reaches its low drag range at 36 mph, and its best L/D range at about 23 mph. The straight ahead stall speed is about 18 mph with the

The Tern is uncompromising in its aerodynamics. Parasite drag is almost non-existent. Full-span flaperons (they're also spoilers) optimize the thermal capabilities.

PARTS LIST

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18a	Aileron Rib	2	53	Fin Butt Rib	1
36	Wing Butt Plate	2	54	Fuselage Joint Rib	1
37	Spar Assembly	2	55	Fuselage Stiffener	2
38	Blade Stack	2	56	Rudder Horn	1
39	Skid Doubler	1	57-64	Fin & Rudder Ribs	1 ea.
40	Aileron Crank	1	65-74	Elevator Ribs	2 ea
41	Fork	2	75	Compensator	1
42-43	Rudder Hinge	1 ea.	76	Main Bulkhead	1
44-45	Hook	2 ea.	77	Tray Assembly	1
46	Aileron Horn	2	78	Forward Bulkhead	1
47	Elevator Horn	1	79	Skid	1
48	Elevator Spar	2	80	Slide Board	1
49	Rudder L.E.	1	81-82	Spar Blocks	2 ea.
50	Web Doubler	4			

flaps neutral, and 15 mph with the flaps full down.

For thermal flying, ■ short turning radius is an asset. Turning radius is determined by angle of bank and speed, with the minimum radius limited by the stall. So, to make use of smaller thermals, it becomes desirable to lower the stall speed. This is why the Tern has full-span camber control (flaperons). Lowering a few degrees of flap is like changing to ■ different airfoil section. As the flaps go down, the stall speed and the minimum turning radius are both reduced. When flying in the high sink air, the flaps can be returned to neutral to get speed and penetration. They can be trimmed at 2-3° to get the best glide ratio.

Negative flaps have the same effect as spoilers. If the landing is planned, such that a nominal amount of negative flap can be used throughout the approach, the glide angle can be increased or decreased as the pilot pleases. The elevator trim is coupled to the flap servo to maintain a more or less constant airspeed ■ the flaps are used. The amount of couple to use depends on a number of variables, so it must be found for each plane by trial and error. When shooting a spot landing, the glide can be extended at the last moment by lowering the flaps. The plane then continues to fly past the original touchdown point, as it slows down to the lower stall speed. *(With my luck, the original touchdown point would probably have been, for once, the spot—Editor.)* The long flaperons also give the Tern a very responsive roll rate, which is not a common trait for sailplanes with high aspect ratios.

MATERIALS LIST

Item	Quantity	Used To Make
Soft Balsa*		
3/32 x 2 ■ 36	34	1-34, 57-74, spar webs, wing skins, skin doubler
3/16 x 2 x 36	1	3a, 18a, 35, 36, 53
1/16 x 2 x 36	4	37, fin skins, elevator skins
1/4 x 5/8 x ■	1	49, 54
Hard Balsa**		
1/8 x 1/2 x 36	6	51, 52, wing leading edge
1/4 x 1/4 x 36	1	pushrods
1/4 x 5/16 x 36	1	fin & elevator leading edge
3/16 x 5/8 x 36***	■	aileron hinge spars, rudder ■ elevator trailing edge
Spruce		
1/8 x 1/4 x 48	8	37, 77
1/8 x 1/4 x ■	■	37, 77
1/8 x 1/8 x 36	1	77
3/32 ■ 1/4 x 36	1	48
3/16 ■ 3/16 ■ 36	1	37, 76
3/16 x 3/8 x 36	1	39
Plywood		
1/8 x 12 x 12	1	37, 47, 76, 77, 78, 80, canopy frame
1/16 x 12 x 12	1	36, 37, 39, 47, 50, 55, 77, 80
1/32 x 6 x 12	1	aileron hinge pads
Aluminum		
1/16 x 3 x 15	1	40, 41, 46, 56, 75, 79, 80
1/32 x 1/2 x 3****	1	42, 43
Brass		
1/8 O.D. x 15 tube	1	40, 47, 75, elevator hinge, ■ wing socket
3/32 O.D. x 10***	■	rudder hinge
1/8 dia. x 6 rod	1	aft wing attachment pin
1/16 dia. ■ 10 rod	1	rudder hinge pin
Music wire		
1/8 dia. ■ 12	1	elevator attachment pins
3/32 dia. x 12	1	wing attachment hooks (44 & 45)
■ 1/2 x 11 x total stack of 3/16		38
Pushrods 12 links, ■ rods		**Flat ■ead Mach. Screws**
Round Head Mach. Screws		No. 2 x 1/4 ■
No. 3 x 1/2 2		No. 2 x 3/4 1
No. 3 x 1/4 1		**Sheet Metal Screws**
No. 4 ■ 1/2 2		No. 4 x 3/8 20
No. 4 x 1/4 2		

*4-6 lb./cu. ft.
**12-16 lb./cu. ft.
***trailing edge stock
****brass or aluminum optional

A three-channel system, with four servos, will operate the controls nicely. Couple the aileron and rudder by plugging both servos into the aileron output of a receiver. Most radio manufacturers make ■ tandem plug set for this use. To get the correct couple, set the rudder to travel at one in. while the ailerons ■■ at a total travel of 9/16". Observe the plane as it rolls into a turn. If it skids, reduce the rudder travel. If it slips (outside wing seems to hang back) increase the rudder travel. Elevator travel should be 1/4" each way, measured at the trailing edge. For the first flight, be sure the balance is within the limits shown on the plan, and that the neutral elevator position is parallel to the thrust line.

The Tern was not intended as a trainer. . .lighter and slower planes are better for that. If, however, you have flown enough to feel confident with a slower plane, I think you will find it a pleasant and exciting experience to fly a Tern.

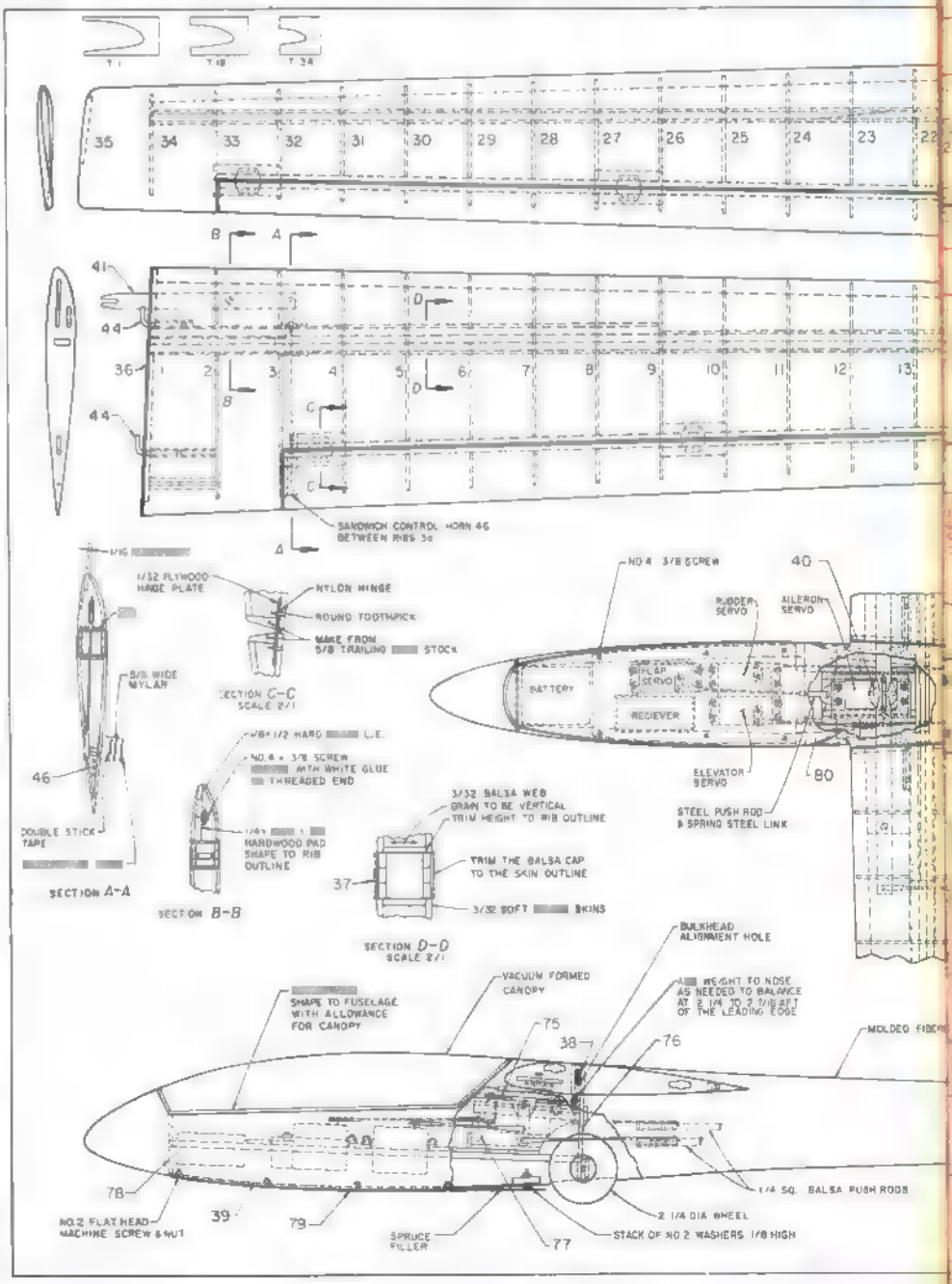
Konrad Nierich built the prototype. He finished it just one week prior to the North-South Challenge Meet at Bakersfield, California. As ■ rule, one would think that a week is not enough time to gain contest proficiency with a new plane. . .but Konrad is an exception. He won the Speed event, placed 5th in Precision, and 12th in overall points. The contest hosted 96 scoring contestants, from 15 participating clubs.

Konrad is ■ long time advocate of high wing loading to improve performance and flyability. His experience was repeatedly called upon to help make decisions for the design and construction of the plane.

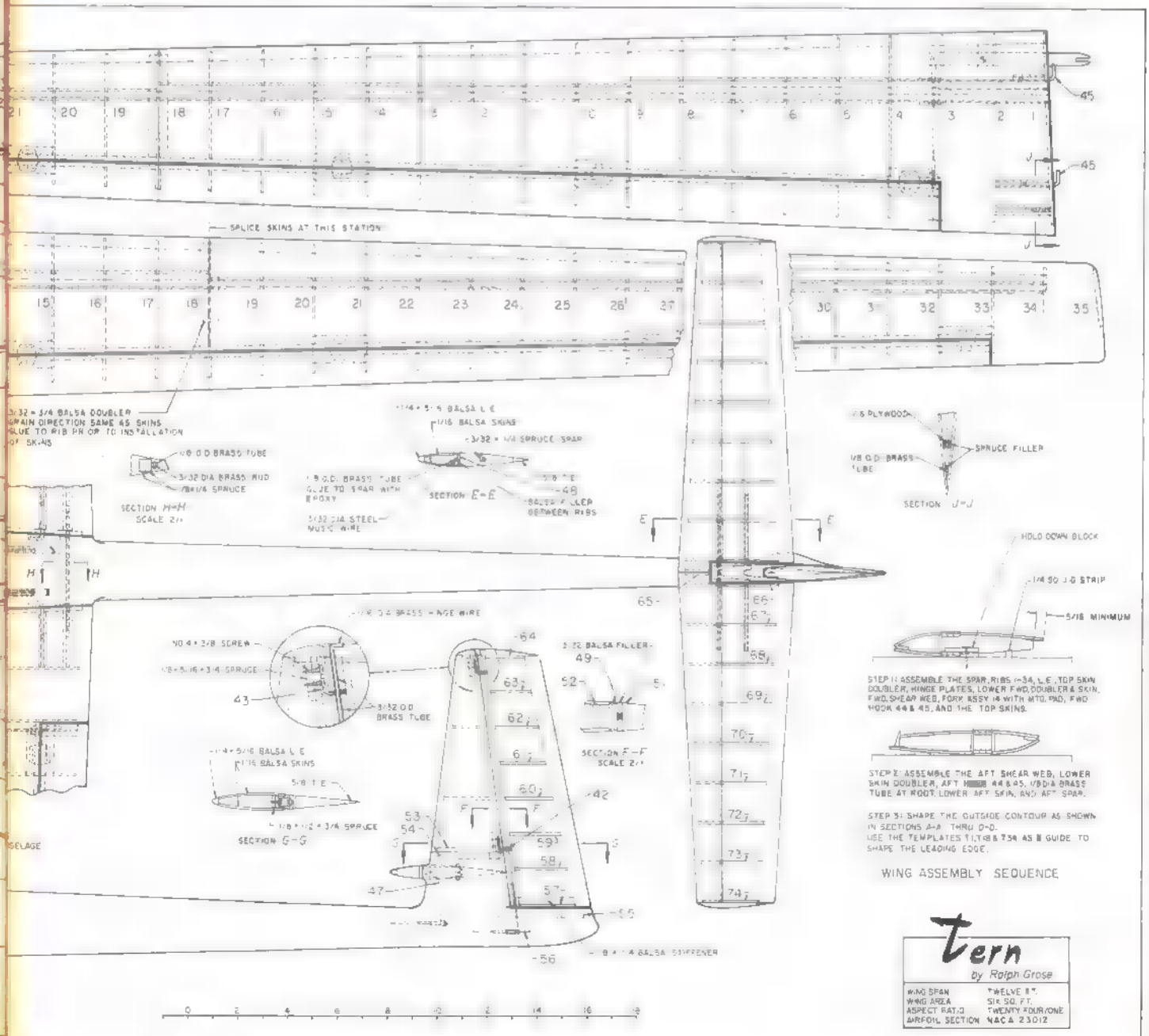
CONSTRUCTION

A fiberglass fuselage is available from Denovo Models, P.O. Box 2145, Westminster, California 92683. Fuse $35; canopy $4.

Begin with item 38 (on smaller plan sheet), blade stack. The strapping



Just as impressive at rest, the Tern looks like soaring personified. Fiberglass fuselage and steel reinforced wings make for durability.



FULL-SIZE PLANS AVAILABLE—SEE PAGE 86

material referred to is the kind used on shipping boxes. Material thickness is optional, providing the total stack height is about 3/16."

Use epoxy glue for all spruce to spruce joints. For spruce to fiberglass, epoxy glue or polyester resin is a good choice. Small strips of fiberglass cloth can be used to form fillets, such as around the edge of a bulkhead. Cured resin should be roughened with coarse garnet paper, prior to bonding. If 48-in. spruce is not available for the spar flanges, additional splices may be made without loss in strength. However, the spar glue joints are critical, so use care when fitting and don't spare the epoxy.

A close fit between the wing attachment socket and item 38 can be made as follows. Glue item 81 (filler block) between the upper and lower spar flanges. Shape the tapered dihedral wedges to match the blade stack height and width. Wrap one layer of waxed paper around the blade stack. Glue Glue and clamp the wedges and item 82 (filler block) in place around the blades. When the glue has set, remove the blades by pulling the center one first. To remove the waxed paper, push the stack back through. Complete item 37 (spar assembly) as shown, prior to starting the wing assembly.

The wing is assembled using the sequence shown on the plan. You will need about six hold-down blocks, as shown in Step 1. The ribs are notched to provide 2½° of wash-out, when the wing is built on the 1/4" sq. jig strip.

Note that the skins are spliced at rib 18. When gluing the 3/32" doublers to the rib, align them with the wing thickness taper so that the skin will lie flat. The skins [illegible] installed in individual 36-in. lengths, rather than the more normal splicing prior to installation. The forward lower skin will have to be held against the ribs with a 1/32" shim while being glued.

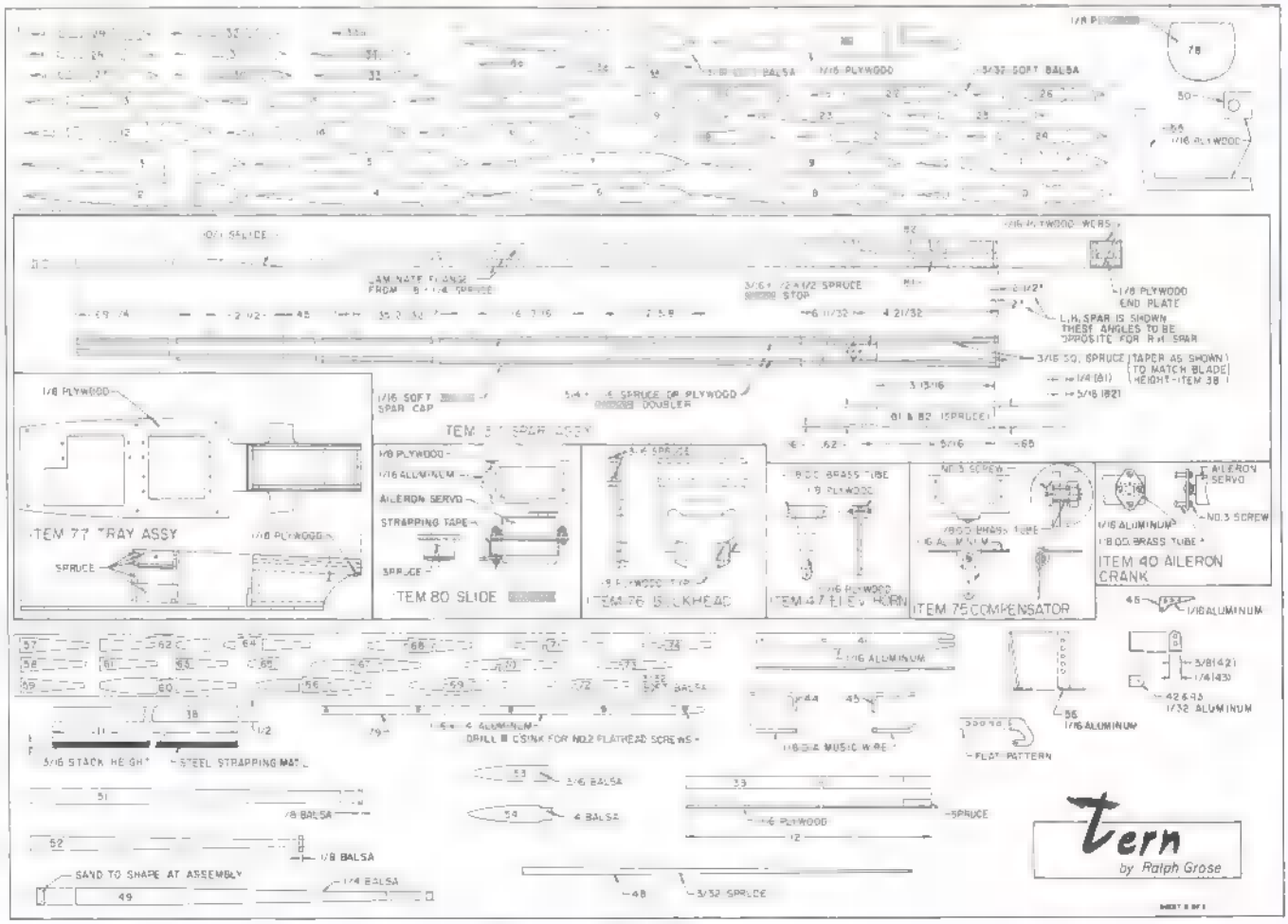
Pockets for the nylon hinges are made by wrapping [illegible] one-in. piece of waxed paper around the 1/32" plywood hinge pads. These cover the hinge area while the aft top skin is being attached. When finished with Step 1, remove the wing from the hold down blocks by pushing forward. Build both wing panels to this point; then compare them for wash-out. The exact amount is not critical, but they should be alike. Corrections can be made when the lower aft skin is attached, but that will be the last chance, so particular care must be exercised at that time.

Rib No. 1 is extra thick, to facilitate sanding to [illegible] good fit with the fuselage. Attach it with a 1/16" excess thickness past the end of the spar. Prior to adding item 36 (end cap), trim rib No. 1 to match the fuselage. When the wings are properly aligned, the aft edge of the spars forms a straight line from tip to tip.

The item 36 (end cap) can be used as a template to match the location of items in the wing to corresponding items in the fuselage, then attached to the wing. This part helps strengthen the wing socket, so epoxy glue should be used.

(Continued on page 82)

Just get [illegible] feel for the [illegible] of this bird. Twelve feet is nominal these days. . .but six lb. ain't. There are good reasons for flying at this weight, however.



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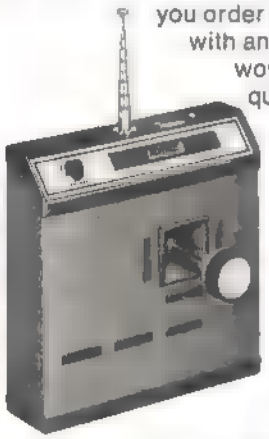

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Sandwiched Ribs

The correct way to get accurate ribs with the sandwich-and-sand method.
by Edward Klossa

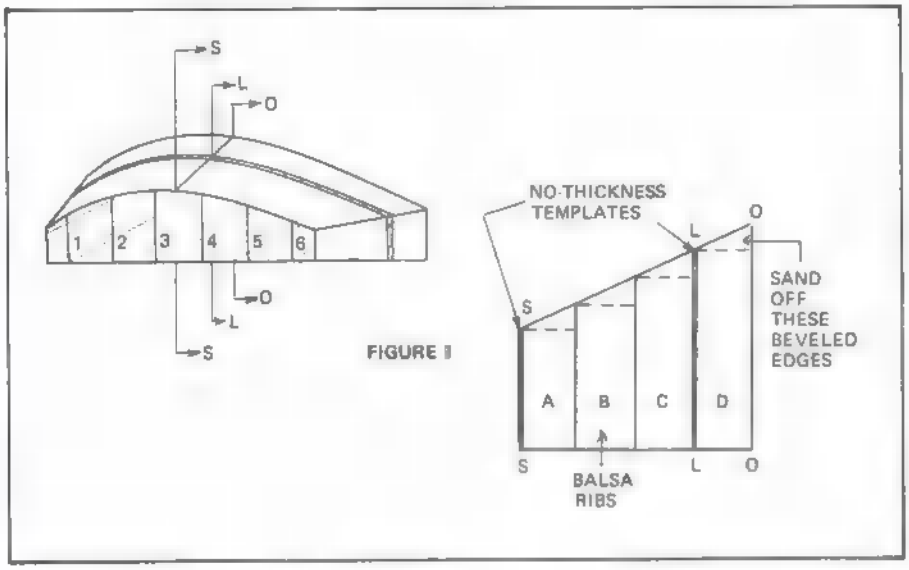


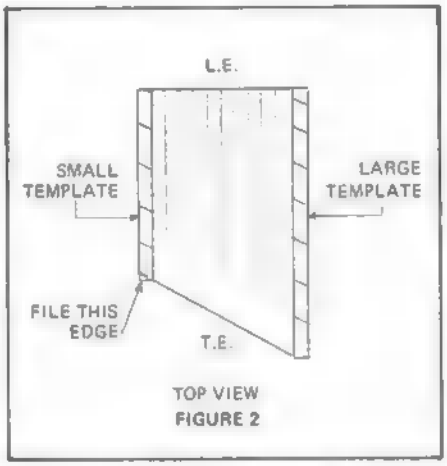
FIGURE 1

If you have ever used the sandwich method of making ribs, chances are that your procedure was wrong. Every method ever outlined in the model magazines was incorrect!

Plotted rib accuracy begins with the precise transfer of the rib from paper to template. With carbon paper placed between .032" hard sheet aluminum and the plans, Scotch tape everything down so nothing moves. Trace the outline of the root chord rib, using a very sharp 6H pencil. No free hand stuff here. Use a ship's curve and a straight edge.

When the plans and carbon are removed, you should have a beautiful outline of the rib on the aluminum. Did you have the carbon facing the wrong way? Or was any part not traced? Nobody is perfect, so try again. When a successful tracing is completed, go over the carbon outline on the aluminum with a sharply pointed instrument, such as a sewing needle in a pin vise. Do not wait, because part or most of the carbon outline will be obliterated in nothing flat when you handle it.

Now, with tin snips or any suitable cutter, snip just outside of the scribed line. Use a file to bring it right to the line. The result is an accurate replica of the root rib. Follow the same procedure for the tip rib, and you are in business. Check the accuracy of the metal templates with the plans and, if necessary, file off any excess. Now scribe seven equally spaced vertical lines on the outside of the rib patterns, along the length of the airfoil (not equally spaced along the length of the rib). Mark the lines one to seven (refer to sketch). An easy way to determine the spacing of the lines is to divide the airfoil in half, then divide the halves in half, and the quarters in half. These vertical lines will be used later as an aid in correct sanding.



TOP VIEW
FIGURE 2

Now all that needs to be done is to place a number of balsa blanks (equal to the number of ribs in one wing panel) between the two aluminum templates, and chop the balsa down to size. Right? Wrong. Remove one rib blank, because you have one too many.

Take a look at Figure 1, which is a cross-sectional view of a stack of three rib blanks (A,B,C) between no-thickness metal templates (S-S and L-L). In addition, one extra blank (D) is placed against the outside of the larger template.

Upon dismantling, one soon notices that each rib has beveled edges, so that [redacted] side of the rib is larger than the other side. Compare the smaller side of rib A to the smaller template, and it is apparent that they are of equal size. Obviously, the larger side of the rib is oversize, when matched to the template. Sand off the beveled edges, without touching the smaller side edge, and you have one perfect balsa rib.

This is easy enough; but if you are fussy, color the bevel edges with a felt pen, and sand the ink away, except for a thin line along the side of the low edge. The result is a perfect rib which exactly matches the pattern. Do the same with ribs B, C and D, and remember, rib D was outside the no-thickness template. Again, comparing all the ribs to each other and to the templates, it seems that each rib becomes progressively larger, at equal increments. Only rib D, which was outside the pattern, matches the larger template. Certainly not rib C which was just inside the large pattern, and which is one increment too small. Therefore, if the correct number of rib blanks to be used in the sandwich method of making ribs includes one balsa blank just outside the rib templates, the number of blanks between the templates is one less.

In practice, since the templates do have thickness, one works only with the balsa between the templates. Later, aside from the stack, cut a balsa duplicate of the larger template, and you have all the ribs. Also notice, in Figure 2, that only the inside edge of the small template needs to be exact, and the outside edge could be filed off, since it slightly gets in the way, mostly at the trailing edge.

Now, with one less balsa blank bolted between the templates, use a razor plane to remove excess balsa to within 1/16" of the templates. Starting with a course grade sandpaper, and ending with 400 grit, sand the balsa flush with the templates. Keep the sandpaper tangent to the ribs at similarly numbered stations going from 1-1 to 2-2 to 3-3, etc. Remember the seven vertical lines on the outside of the templates? As the sanding gets close to the templates, check your work frequently, by placing a straight edge across the ribs at the numbered lines. Be careful not to remove too much balsa by undercutting. When near completion, use the 400 grit sandpaper.

After dismantling the stack, keep in mind that the smaller side of the rib is the reference side, and any marks across the ribs (for spars, etc.) should be referred to this side. Rather than notch my spar cut-outs while stacked, I prefer to run a razor across the top and bottom of the ribs, making a 1/16" deep cut. Then each rib can be worked on separately.

A set of ribs for the other panel is best done by duplicating each rib, in that any error made while sandwiching will be the same in both panels. The panels will then balance each other aerodynamically.

Referring to Figure 1, notice that the larger side of rib C is an exact copy of the larger template. It is possible to go the other way, and use the larger side of the ribs, with no sanding after unstacking. This would mean adding one duplicate of the smaller template for a perfect set of ribs. . .except for one flaw. The knife-edged bevel makes a poor gluing surface. This set has one useful purpose though. It would be very helpful in drawing a set of ribs for your plans.

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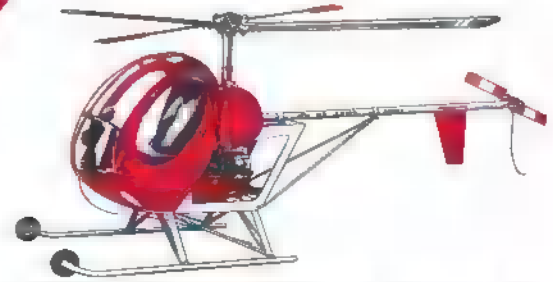

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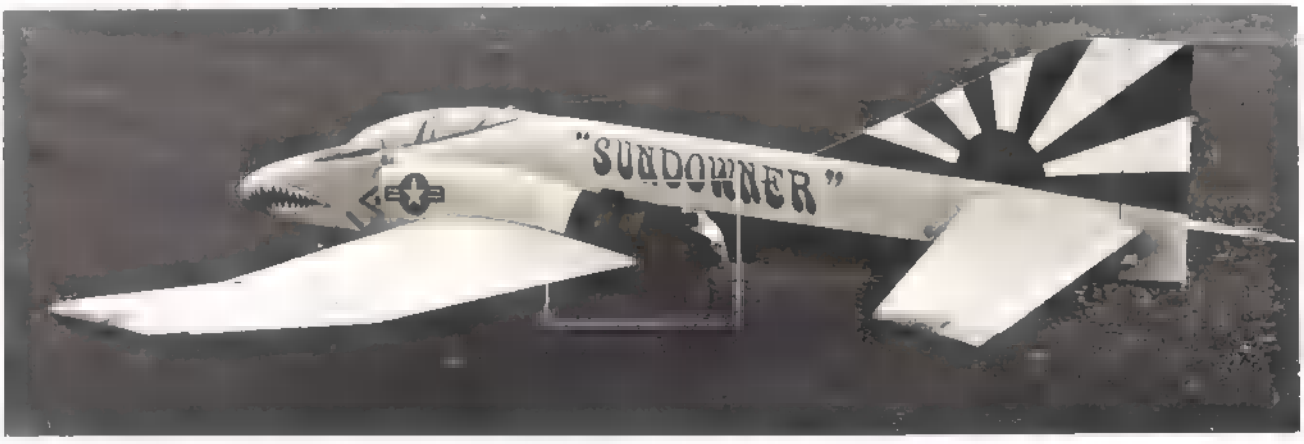

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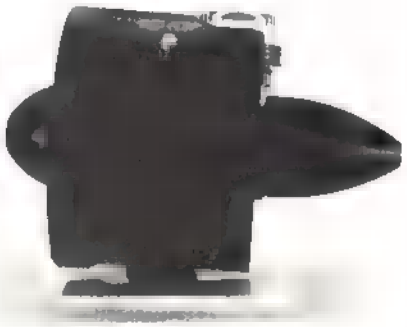

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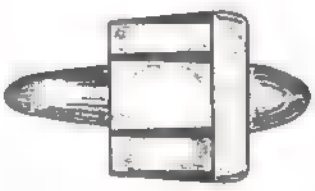

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SUNDOWNER

Everyman's dream of jet flight is now reality. This Phantom is uncomplicated, safe, totally throttleable, and has thrust like a jet should.

by Bob Violett

Photo by Ed Sweeney

It's been a long time coming! There have been many noble efforts along the way toward the successful development of true ducted fan flight, but these have always produced something less than maximum efficiency. Having probably already glanced at the photos that accompany this article, I'm sure that your scepticism is equal to what mine was about six months ago, when AAM's Editor asked that I consider building an airplane around the new J.J. Scozzi "Turb-Ax 1." Let it suffice to say that, as a modeler tuned to the high performance spectra of RC, it took only one demonstration of the thrust of this unit to really turn me on to the project.

A reasonable question is why a 40 cu. in. engine was chosen, instead of a 60? The answer lies in horsepower and available rpm. The 5" fan must turn faster than an 11" prop, to gain comparable efficiency. At these higher rpm, the newer K&B 40s, Supertigres and HPs (rear rotor) develop more horsepower, on the same fuel, than do most of the pattern 60s. Furthermore, by using a 40, the overall mass of the power unit is held to an acceptable level, so that it adapts well to the airframe sizes to which we are accustomed.

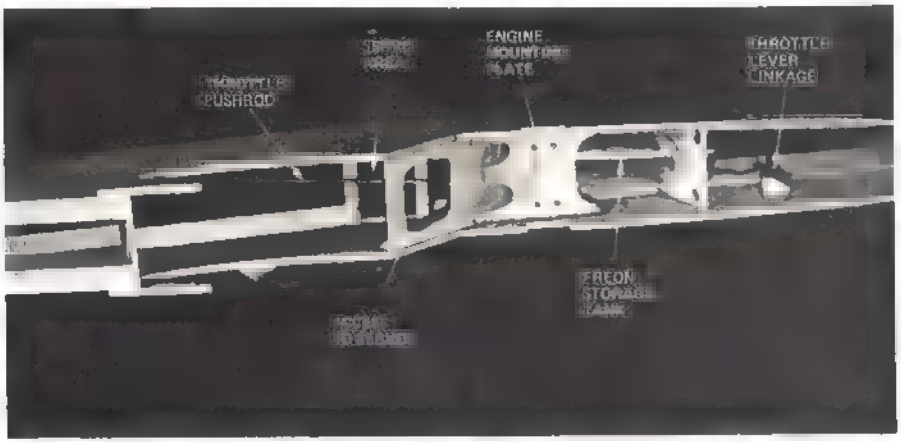
The operation of the unit is uncomplicated. Starting is achieved by a prime in the exhaust and one snappy flip against compression. A belt starter, as utilized by the boat and helicopter folks, can be used by the less adventurous. Throttle is achieved by the same method employed on control line Navy Carrier models, via fuel metering and a slide exhaust baffle. The Turb-Ax instructions detail this throttle setup.

The vibration level of the fan is lower in amplitude, but higher in frequency, than prop-driven engines. A nice secondary benefit of jet power is that, if you are thinking retracts, you'll never wear out another nose unit.

It is believed that the most enthusiasm for this new concept in power sources will emanate from stand-off scale and pattern (although the appeal to the average sport flier and would-be designer is very strong). With this in mind, the Sundowner evolved from a series of three aircraft, which were built and flown with the Turb-Ax unit. The first two were something less than fantastic; but then, I didn't win anything with my first pylon racer either.

The McDonnell-Douglas Phantom, after which the Sundowner is modeled, is the mainstay of the U.S. Navy and USAF fighter wings, as well as many allied air arms. As a subject for this project, it not only offers this universal

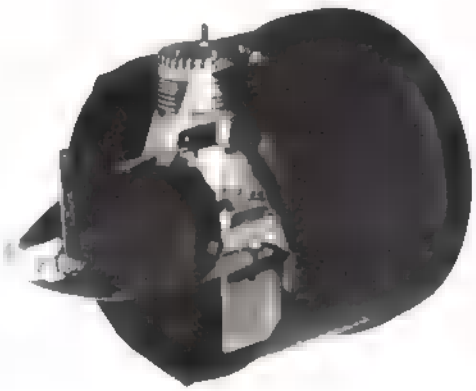
ABOVE: If the absence of a prop on the Phantom doesn't send you up a wall, tear out this page and make yourself a paper glider. BELOW: Typical equipment placement in the Sundowner.

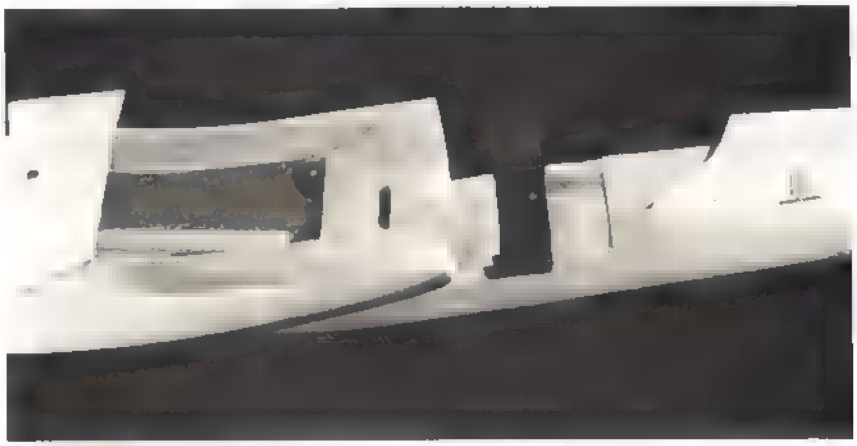


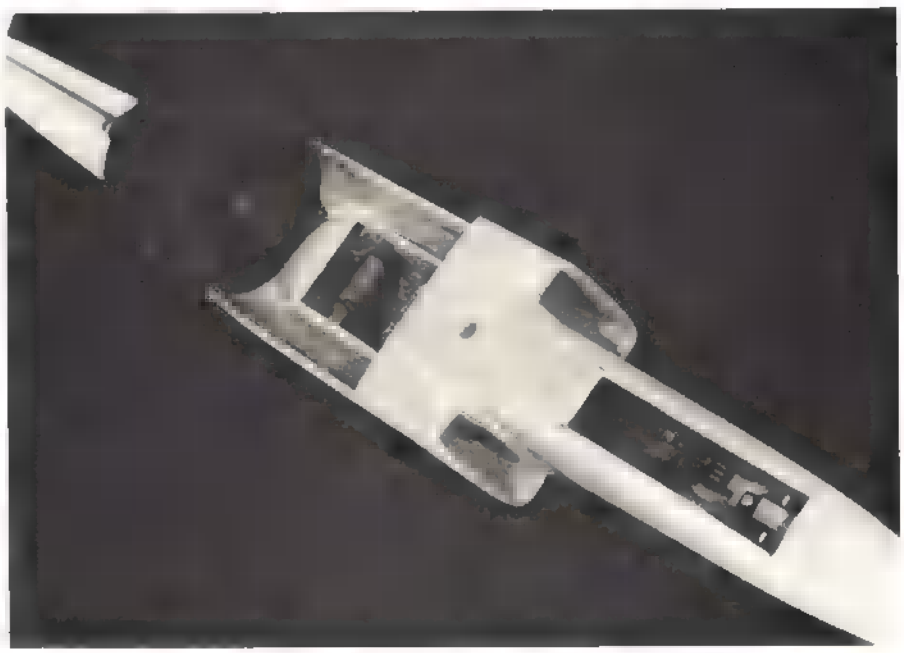
appeal, but the design has everything in the right place for an aerodynamically sound model. The proportions are generous enough that stand-off scale appearance could be achieved in a model designed around proven pattern aircraft moments and areas. The frontal view of the Phantom is almost completely captured and, except for the elongated tail moment and single power unit, the planform and profile are quite characteristic of the full-scale F-4B. The rakish lines of the model are true to the prototype's form. Sundowner is named after Navy Squadron VF 111, whose F-4Bs sport this striking paint scheme.

My goal was to prove that, with the Turb-Ax fan unit and the horsepower available from a K&B 40, I could match the performance of a 60 prop-driven pattern ship. With this in mind, and a desire to stick with accepted construction techniques and materials, the Sundowner was born. If you can build and fly any of the popular balsa and foam pattern aircraft, and are interested in jet power, you qualify for this project.

If I haven't convinced you yet to build this Phantom, then skip over this next section, and read the paragraphs on "Flying," as well as the "Flight Report." Those should convince you to order a set of plans. Now we can con-







ABOVE: The Turb-Ax I unit, with throttle linkage mods, as shown in the instructions which come with the unit. The fan is a beautifully made and highly engineered assembly. TOP RIGHT: The engine mounting is far less complex than the front end of the average prop-driven model. The mounting strap for the fan unit simply bolts in place. RIGHT: Resembling some sort of machine from a science fiction movie, the fuselage and fan assembly present a very "unordinary" appearance. The construction is just the same as any other fuselage.

All Photos by Eric Meyers, except as noted.

tinue with the construction text, which follows.

CONSTRUCTION

It is assumed that you have the basic skills of building and flying, so I will only point out areas of particular importance to "Jet Flight."

Start the wing by notching the foam cores for the 1/2" full-depth medium hard balsa spar. Join the halves (no dihedral) with epoxy. Note that the retract boxes are located aft of the spar, where another piece of 1/2" balsa helps absorb the landing loads on the main spar. Install the aileron bellcranks and the 1/16" pushrods, allowing one end of the crank to extend beyond the polyhedral break. The 1/2" balsa spar for the ailerons is then glued in place, and trimmed to the foam surface. Sheet the cores with 3/32" light balsa skins, cap the leading edge and wing tips, razor plane where necessary, and sand the final structure to shape.

The polyhedral in the wing is a very obvious feature of the Phantom, and it is quite simple to achieve. Hack through the wing with a fine tooth saw (don't cut the bellcranks) and then simply sand the tip section to the proper angle. Butt-join with epoxy. How simple! Cut through the 1/2" aileron spar. Bevel the leading edge of the flapper and hinge.

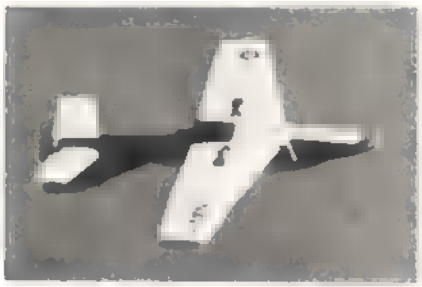
Again, with a fine saw, hack out the center section shroud cut-out, and cap the sides with 1/64" ply. Use epoxy here—water base glues warp the thin veneer. The forward edge of this engine access area is radiused and capped with 1/2" soft balsa.

Retract installations are old hat now, so do your own thing here. Just keep the strut location as depicted. With all of these holes in the wing, you might wonder how it stays together? It relies on skin integrity and, for this reason, I suggest using the K&B 3/4 oz. cloth and resin technique, as spelled out in the Superpoxy instructions. A subject of a future article will be a wing unit that can utilize MonoKote.

The stabilizer design was ripped off from Jim Martin's Banshee. As a matter of fact, he built this one for me. It would embarrass him to say how many he built before he got one that I would use. (Just kidding, Martin!) Actually, it's the best system I've seen for producing a light, airfoiled, straight stabilizing surface. The stab, complete with elevators, weighs 1½ oz., less finish. Jim best describes the construction system in his Banshee kit by J&J Industries.

Build the stab as one unit, then saw it in half and bevel the inner faces to get 22° of anhedral (another distinctive Phantom trait). Butt-join with white glue. I'm sure some of you question why I didn't opt for a flying tail? Answer: The next model will have one. The

SUNDOWNER FLIGHT REPORT
AAM Staff



On flight day, the Sundowner arrived, so new from the building boards that dust hadn't even settled on the wing. The AAM staff had turned out, like a group from Missouri, with a skeptical "I'll have to see it to believe it" attitude. We still had trepidations about this being another marginally powered ducted fan model.

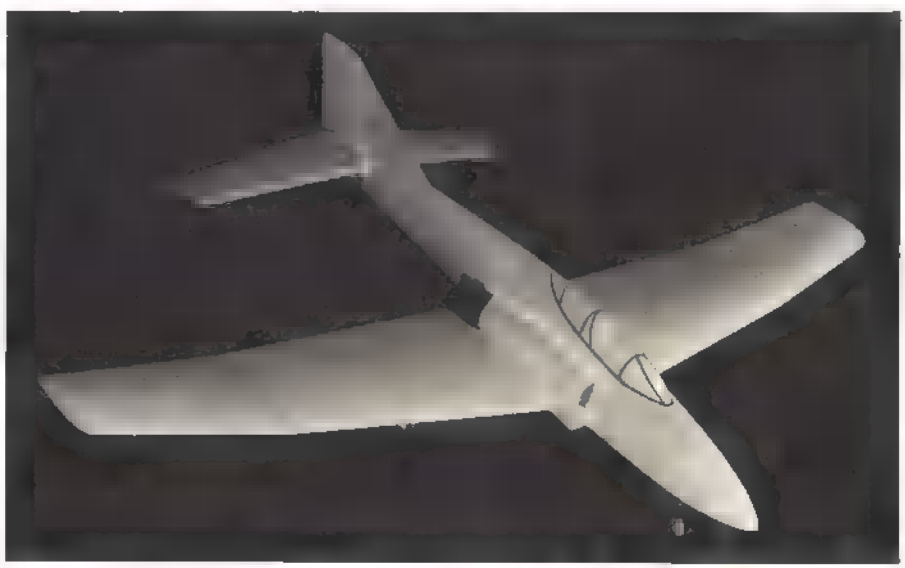
True to form, the wind was gusting at about 20 knots. After a one-flip start of the new Turb-Ax I fan unit, Violett was taxiing out, almost before the photographer could reload film. The fan howled as the F-4B accelerated.

Takeoff roll seemed very satisfactory (about 100' on a paved runway), and rotation was crisp and positive. The Sundowner was already into a big Split-S at the end of the field by the time everyone's heart beat was returning to normal. The only fair comment about the flight characteristics of the F-4B is that Bob did two low rolls on his first downwind pass!

After that convincing display, the rest was gravy. Acceleration was phenomenal. The FAI Top Hat had a nice high base leg, with the model tracking perfectly through the rolls. Within minutes, everyone realized that the Sundowner could hold its own with any pattern ship. All aerobatic attitudes were precise and cleanly defined. The rolls, which weigh heavily in the new pattern, easily ten pointers.

The flight ended with engine flame out (jet talk for ran out of fuel), and Sundowner set a very smooth and stable glide path (rock solid in the turbulent air). The landing was a good "mains first" affair.

Subsequent flights reaffirmed the exceptional potentials of this ship for competitive flying. There are more doubting Thomases on the AAM staff anymore. We've seen that the Sundowner fulfill the highest expectations of the most demanding pilot.



TOP RIGHT: The top blocks are ready for some mad whittling. It might be easier to contour the canopy as a separate block. BOTTOM RIGHT: The sculptured, clean lines of the Phantom are accentuated by the almost hidden engine. Painting the duct shroud would conceal it even more.

vertical fin and rudder should be light and straight. To say more on that subject would just insult you.

When constructing the fuselage, keep in mind that the power package has changed location from that of the conventional (but now antiquated) prop-driven machine—thus, the stress members in the fuselage are relocated. Framing up the sides with 1/32" ply doublers, and formers 1 through 6, is very basic. Aft of the power platform, the fuselage sides bend gradually, to form a triangular cross section at the tail post. Use 6-32 bolts and blind nuts to secure the mounting strap (which is supplied with the Turb-Ax unit) to the 1/4" ply power platform. The aft turtle deck is of soft sheet, consisting of two side pieces, custom fit, then capped with the top plank.

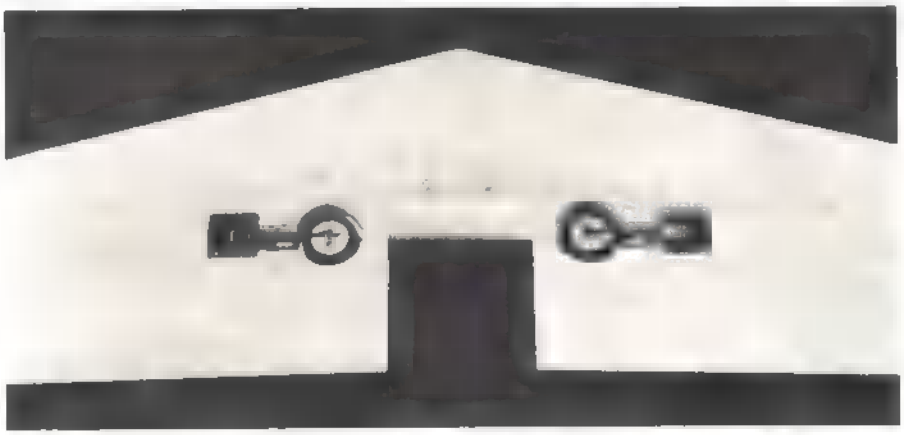
The servos are mounted three abreast, on 1/4" ply rails. At this time, the pushrods are installed. I use 1/16" wire inside the yellow portions of semi-flex Gold 'N Rod. The elevator rod must, of course, have a "Y" section soldered at the aft end, to operate the separate anhedral elevators.

The forward top deck and canopy [illegible] blocked up and spot-glued, along with the nose cone (more jet talk) and bottom 1/2" plank. Carve and sand the canopy blocks to the desired shape, then remove and hollow out. The canopy can also [illegible] constructed as a separate unit.

The intakes are functional, and require a little craftsmanship. Assemble them from 1" pieces and 1/4" sides, and tack-glue the assembly to the fuselage (with the Turb-Ax shroud in place) and shape the outside contour [illegible] indicated on the drawings. Now remove these sections and hollow out to [illegible] thin wall section (about 3/16"). Cover the inside with 3/4 oz. fiberglass cloth and resin, then glue the ducts permanently to the fuselage sides. Do this step with the wing in place, to ensure proper alignment.

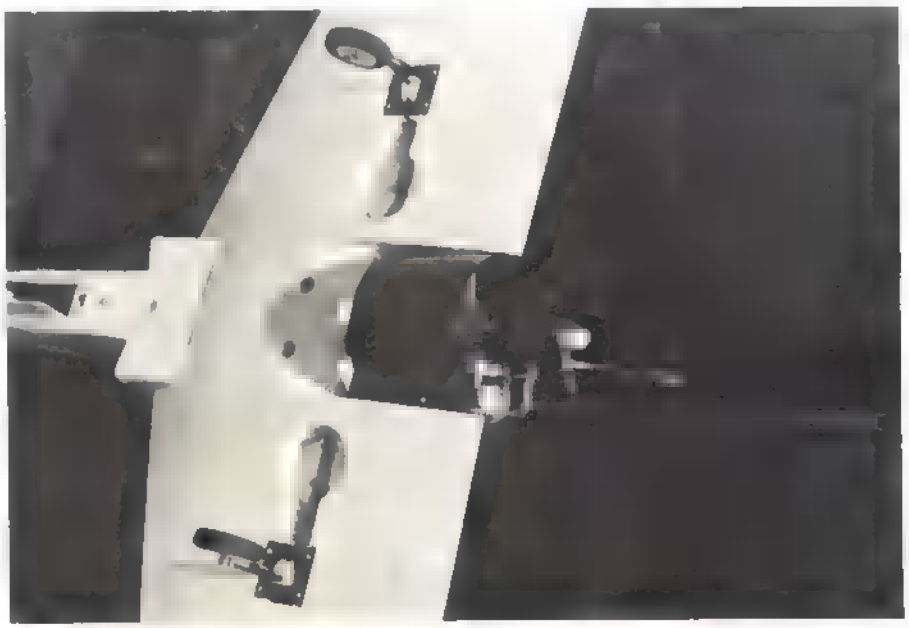
Install the throttle linkage. Mount the tail surfaces, making certain everything works. Now button up the bottom by adding the laminated ventral fin and 1/16" balsa bottom sheeting. Install the [illegible] gear, with operating door. At this time, also make the stone deflector from .01 brass stock. Solder it to [illegible] wheel collar and install on the nose strut. This little gadget is essential to troublefree operation of the impeller blades in any ducted fan. The deflector may be removed for grass field operation. Cover the fuselage with 3/4 oz. cloth and resin, and the worst is over.

I use the K&B Superpoxy paint system, and find it to be the best and most durable paint on the market today. It's conceivable that you may want to use high nitro fuels for an extra 1/2 pound of thrust (when you really want to show off). You can pour that hot fuel all over Superpoxy and not harm it. The gray is mixed with K&B's satin hardener, for [illegible] nice matte finish. The finish, from bare balsa to what you [illegible] here, weighs 12 oz. It's hard to beat that for strength and durability. The finished prototype airframe (no equipment installed) weighed 3 lb. 3 oz. All-up weight on the taxi strip is seven pounds.



Retract installation is per usual techniques. The large cut-out, which slips over the ducted fan assembly, does not weaken the wing. Note the radiused face at the front of the cavity.

The engine assembly is totally accessible (and quickly removable). Operation of the Turb-Ax is totally safe and reliable.



FLYING

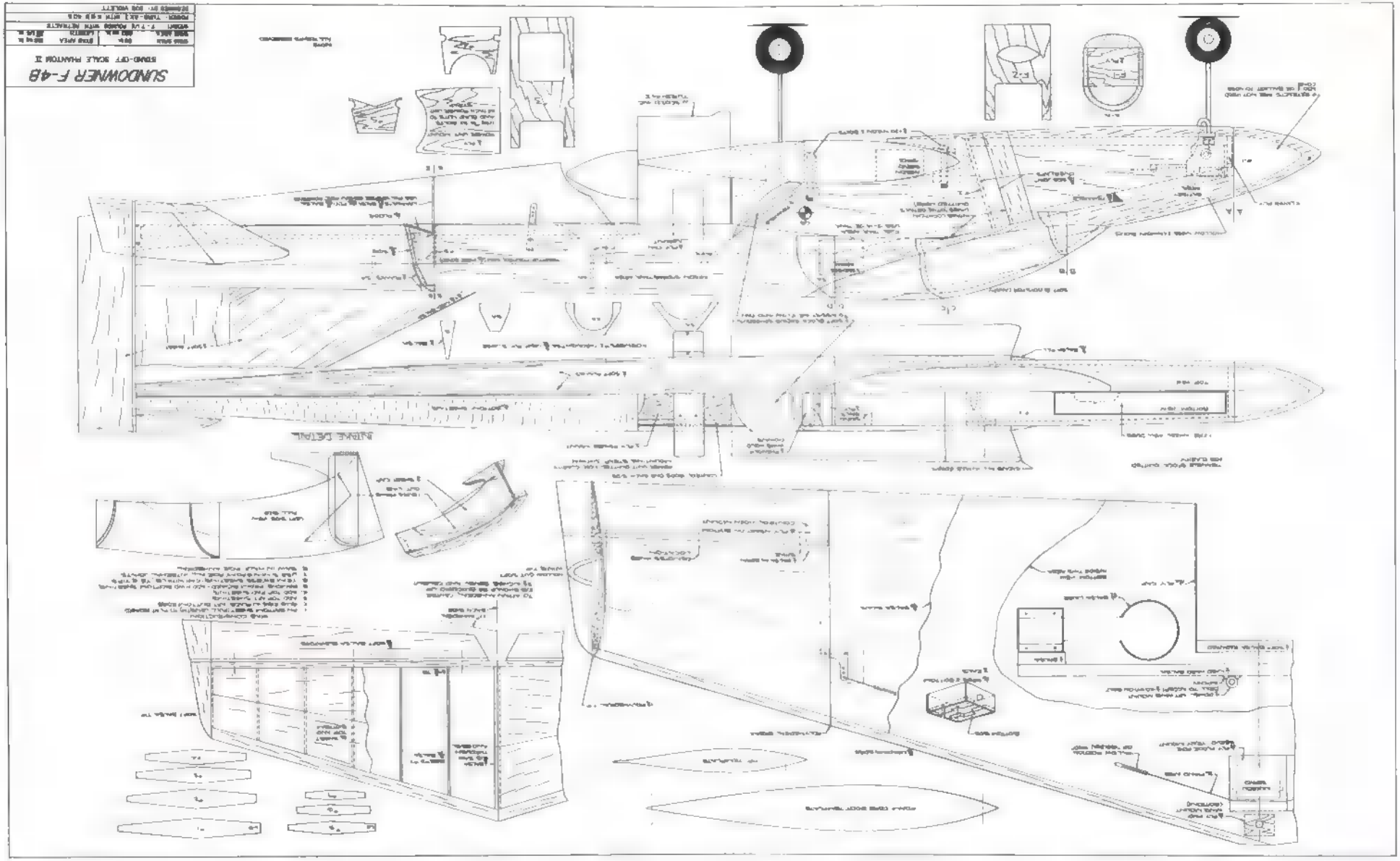
Cast away your fears and disbelief—you're in the "Jet Age" of model aviation now. There are some differences in technique involved in flying [illegible] fan which, once mastered, can maximize the performance of your sleek F-4B. On the positive side, consider that there is no prop wash over the flying surfaces and the front of the fuselage. There is no P-factor or prop effect—no 11" gyro acting on the front of the aircraft. The fan itself is [illegible] gyro, of course, but a much smaller one, which is positioned very close to the center of gravity.

You will notice all of these advantages on the first takeoff. Right rudder, during roll out, is not required... Sundowner just bores straight ahead. This same smoothness and directional stability exists throughout all of the maneuvers. Having the lower part of the rudder in the jet stream is very effective for the Figure M and Stall Turns.

The takeoff roll is slightly longer than the average pattern ship—about 100' on pavement, and 125-150' on grass strips. When maneuvering, a slightly larger radius of turn, and more smoothness on the controls, will conserve energy. These characteristics are inherent in full-scale jets as well, and will require a slight readjustment of your control techniques.

Performance was discussed earlier, and you probably want to know exactly how good it is. Expect speeds of 100+ mph. Sundowner will do the new FAI Top Hat from [illegible] level run in, and it rolls axially better than any model I've flown. If you still disbelieve, suffice it to say that I will be flying the aircraft in pattern competition this season. Also, there will be a Super-8 color film available to clubs and interested groups. For information on obtaining the film, write to me at Route 1, Box 64-B, Clarksburg, Md. 20734. But, don't wait for [illegible] film preview of the action...build [illegible] Sundowner and experience the exhiliration of being [illegible] model jet jockey.

My thanks to Mike Grady, Jim Martin and Eric Meyers for their contributions and encouragement. To the staff of **AAM**, [illegible] thanks for their assistance in getting this material together.



FULL-SIZE PLANS AVAILABLE--SEE PAGE 86

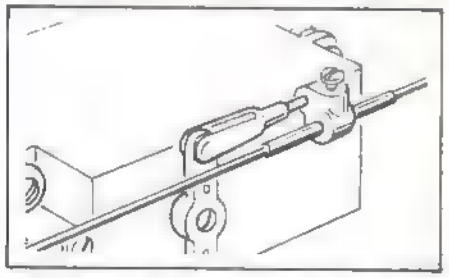
TELL THEM YOU SAW IT IN—

NEW PRODUCTS CHECKLIST

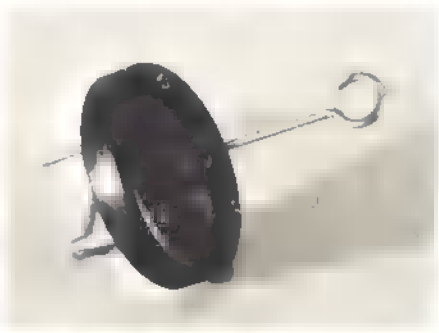
ERIC W. MEYERS

Cox/Tuned Pipe. Latest engine accessory for all Cox engines except the TD 010 is this new muffler, similar to the QZ muffler, but with a pipe for less noise and tremendously increased power. The new line of mufflers fits all engines without modification of head or cylinder. And it has sliding exhaust restrictor to vary noise output and for priming cylinder. Pee Wee and Tee Dee 020 engines—$2.25; 049 and 051 engines—$2.50; 09—$2.75; and 15 size—$3.00. L.M. Cox Manufacturing Co., Inc., 1505 E. Warner Ave., Santa Ana, Calif. 92702.

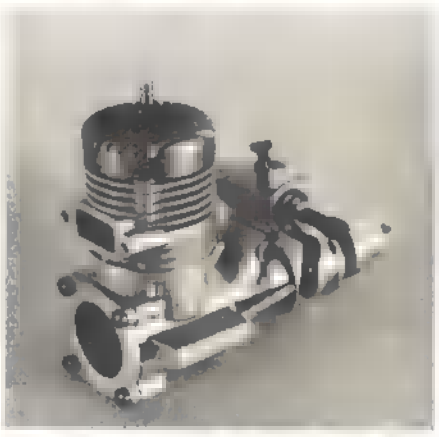
Aerotique/Respirator. A must for the modeler who is concerned about his health, this twin filter respirator screens out harmful balsa dust and paint mist. In fact, almost all air impurities are screened out, making it ideal for modeling use. The unit has two filter elements and two absorbent cartridges and is made of rubber for a comfortable fit. Price is $10.85 each. Aerotique, 19900 Ingersoll Dr., Rocky River, Ohio 44116.



Carl Goldberg/Aileron Coupler. A simple solution to an age old problem of connecting conventional aileron pushrod to aileron servo is solved through this simple fitting. As shown in the drawing, the tube is soldered to the pushrod and unit is adjustable through a nylon Snap-Link. Price is $.69 each. Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, Ill. 60651.

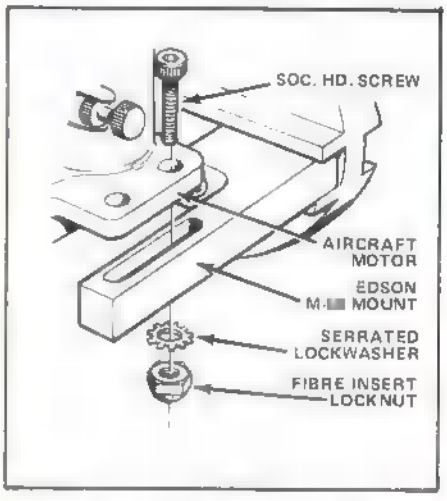


Midwest Products/Geared Winder. Great for up to 24" span indoor models, peanut scale airplanes, etc., is this lightweight winder with a 16 to 1 winding ratio. The new accessory has a steel shaft with a plated shafting hook for long life and durability. A conversion chart is supplied to check the number of turns applied. $4.95. Midwest Products Co., Inc., 400 S. Indiana St., Hobart, Ind. 46342.



Hobby Shack/Taipan 15. This new "gold head" engine is Australian made and features front rotor intake and rear exhaust. The RC version should prove to be a favorite among quarter midget racers due to its high power output and fine workmanship. The engine has twin ball bearings and Schneurle porting. Two versions are available, the TBR R/C 15 for $35.99, and the standard version for $32.88. Angle mufflers are available at $8.88 each. Hobby Shack 6475 Knott Ave., Buena Park, Calif. 90620.

Craft-Air/Para-Pod. Great for modelers without a slope or high start, this is an easy way to launch any glider up to exceptional heights with a minimum of fuss. This unit will not detract from flight characteristics as it automatically drops off and returns by its own parachute after the motor run. .049 power is adequate to lift a two-lb. glider approximately 800 feet. Simple to build, the pod can be completed in less than half hour. Price with chute is $6.95. No extra servo is needed. Craft-Air Products, 5651 Kelvin Ave., Woodland Hills, Calif. 91364.

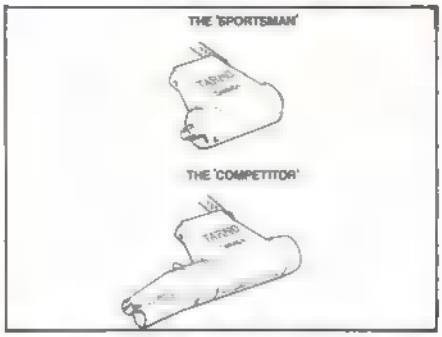


Edson/Mounting Hardware. Designed mainly for motor mount use, this hardware package contains four cap screws, four star washers, five fibre lock nuts and an Allen wrench. The lock nuts are vibration resistant, providing a very secure method of mounting engine or many other items. $1.19 per package. Edson Enterprises, Inc., 381 Franklin Ave., Belleville, N.J. 07109.

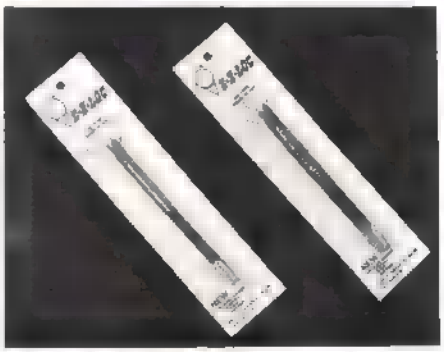
D&B/Military Markings. Tired of peeling, cracking decals? These one mm thickness markings are made from mylar for ease of application and durability. Mylar is colored with a special paint to make them dope-proof and fuel-proof. Markings have a special adhesive which cures in 24 hours, leaving plenty of time to correct placement errors. Fifteen types available in WWI and WWII styles in 1½, 1¼, and 2" scales. Sheets consist of wing, fuse, tail and squadron markings. Price varies from $4.95 to $7.95 per sheet. D&B Model Aircraft Co., 31 College La., Dartmouth, Mass. 02747.

Span Aero/Mini Pathfinder. This might be called a scale airplane, as it was scaled down from the full-sized Dan DeLuca design of the 60 size Pathfinder. The scaled down ship is for economical 29 to 40 size engines, and is great for the sport or budding pattern flying. The all-balsa airplane comes complete with hardware package and fully illustrated instructions. Span Aero Products, Wildwood Lane, Norwalk, Conn. 06850.

Kraft/Plug Analyzer. Handy, simple gadget fits right on top of your 1.5 volt dry cell battery, and gives a read-out of condition of glow plug and battery. Unit contains a rugged meter which measures current flow of the glow plug. On-off switch is incorporated in the design and wires and clips are included. Two styles are available: GPA-R for round batteries, and GPA-S for square batteries. $7.98 each. Kraft Systems, Inc., 450 West California Ave., Vista, Calif. 92083.



Tarno Aero/Muffler System. From the creators of the popular Tarno-Carb comes a completely new versatile muffler system which can create 34 different variants with interchangeable parts. The two basic types—the Sportsman (expansion) and the Competitor (venturi)—can have right or left, tractor or pusher housing positions, with right angle exhaust pipes and exhaust manifolds also available. Great for the modeler with that special muffler need. Pressure tap included, adaptors are not required. Muffler fits most 60 engines and a variety of 40 to 58 sizes. Tarno Aero Engines, 942 Grou, Montreal, Quebec, Canada H4N 2C7.



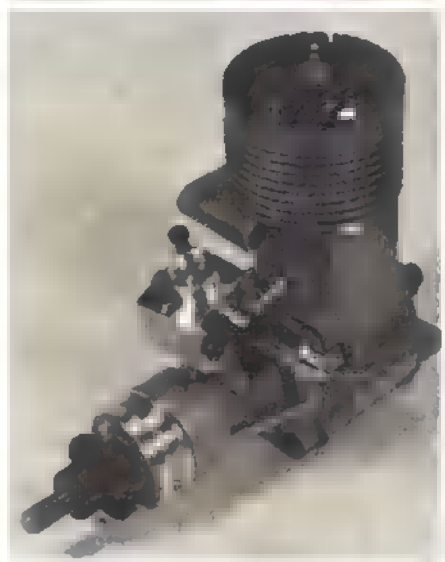
Martin/E-Z-Loc. This neat blade holder tightens the blade through the knurled rear end, thus eliminating chance of loosening blade while working with knife. The holder should solve many frustrations and should eliminate the need to use pliers to obtain a tight, secure lock. This holder has both a knurled rear and front end and is well balanced for easy working. Holder accepts all popular blades. Two sizes (large and small) sell for $2.95 and $3.95 each. A set of the two sells for $5.95. Martin Enterprises, P.O. Box 407, San Marcos, Calif. 90269.

Ekim/Formula Vee Racer. For those modelers looking for one of the new deep Vee class racers, Ekim offers this all fiberglass version of the Formula Vee Ocean Racer. The boat has a 46" length with a 14" beam, and it accepts engines ranging from 60 size up to O&R. Boat should be quick to build its hull and deck are prejoined, ready for hardware and two-channel radio. Hardware is available at extra cost. Kit retail price ranges from $59.95 to $71.45. Ekim, P.O. Box 144, Palmetto, Fla. 33561.

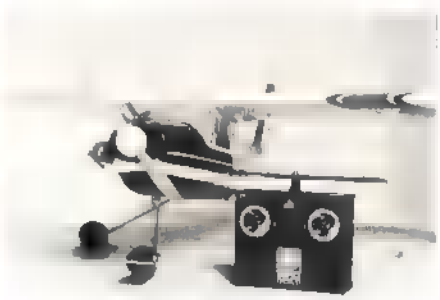
Pro-Line/Accessory Cords. Neat Pro-Line Y harness allows the charging of two airborne packs from transmitter side of a standard charger. This allows charging of three airborne packs from one charger, great for the modeler with multiple systems. Harness sells for $2.95. Another harness is available which allows modeler to check side of his 9.6 V transmitter pack with the battery test meter. Harness is $2.95; test meter $19.95. Pro-Line Electronics, Inc., 10632 N. 21st Ave., Phoenix, Ariz. 85029.

Model Devices/Dihedral Tool. New Dihedral Tool eliminates to pile up blocks and repeatedly measure the height of the wing tip when figuring amount of dihedral. Tool consists of an adjustable, pre-measured support post to which wing tip is securely fastened. Platform can be set at any desired height to 11". Adjustment platform can also be inverted to provide a handy base clamp for holding glued and painted items while they dry. Price is $2.50, postpaid. Model Devices Co., 6822 Glencove Dr., Clifton, Va. 22024.

Stanfield/New Fuels. A new line of glow fuels is available in any Nitro content desired. Stanfield Fuels will provide any combination of oil and Nitro. Oils used are castor oil and synthetic oil, or partial quantities of each. An FAI fuel is available—write for price for your own mix of fuel. Stanfield Fuels, 1617 Laguna La., Ft. Worth, Tex. 76134.



Midwest Model/Meteor 60. A new 60 engine in the under $100.00 price range has many features for excellent power output and long life. Engine has a single Dykes ring and dual ball bearings on crankshaft. The removable prop stud will help keep the crankshaft intact should crash occur. The silencer with muffler tap is included and a full stock of parts is available. Price of the Meteor "Red " is $84.95. Midwest Model Supply Co., 6929 W. 59th St., Chicago, Ill. 60638.



MRC/RTF 177. Great looking Cessna 177 is complete in every aspect and requires only one hour building time to make it ready to fly. The fiberglass fuselage foam-winged airplane is completely finished in a three-toned paint scheme, and all pushrods, wheels and an Enya 35 engine are installed and mounted. Airplane comes with an MRC Mark V five-channel radio and engine with muffler. This combination should be a real hit with modelers who would rather fly than build. 55" span, 500 sq. inches of area, flying weight is approximately 5 pounds. Price is $475.00. Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J. 08817.

OUR Flite Pak Kit will work with YOUR transmitter!

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MRC

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OR ANY OTHER MODERN DIGITAL TRANSMITTER

1-8 FLITE PAK

12G18-2	1-8 FLITE PAK w/2 BANTAM SERVOS	$74.95
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12G18-4L	1-8 FLITE PAK w/4 LINEAR SERVOS	$116.95

The Digital Commander series of kits are designed to be compatable with any modern existing system and offer expansion within the system without the need to buy a complete outfit.

The Flite Pak comes complete with One-Eight Receiver/Decoder, plastic case, number and style of servos specified, switch, and connectors. All you need for building except batteries.

Will operate with any modern digital transmitter on the same frequency. Frequencies available are: 26.995, 27.045, 27.095, 27.145, 27.195, 53.1, 53.2, 53.3, 53.4, 53.5.

1-8 RECEIVER

12G18 1-8 RECEIVER/DECODER KIT $34.95

This receiver features voltage regulated circuitry with AGC and a double tuned front end. An 8 bit shift register in the IC decoder offers up to eight channel operation of positive of negative pulse servos with three or four wires.

Plastic case measures 1.45 x 1.72 in. Weight is 1.4 oz. Connectors ▬ not furnished. Available on 27 and 50 mHz. Please specify frequency.

SERVO

An IC servo amplifier and the popular D & R servo mechanics combine to make a servo that gives superior resolution and rapid transit time. Will operate with 3 or 4 wire IC decoders with positive pulse output.

Available in Bantam (rotary output) which measures 1 1/2 ■ 1 7/16 x 3/4 in or Linear (linear or rotary output) measuring 1 13/16 x 1 7/16 x 7/8 in.

14G20	BANTAM SERVO KIT	$21.95
14G20L	LINEAR SERVO KIT	$22.95

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THE SENSIBLE APPROACH

ADD $5.00 FOR RECEIVER/DECODERS AND FLITE PAKS ON 72 MHZ.
AVAILABLE ON: 72.08, 72.16, 72.24, 72.32, 72.40, 72.96, 75.64.

Technical literature available upon request.

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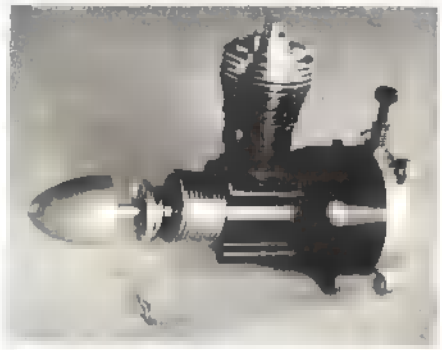
ACE R/C INC.

COX BLACK WIDOW 049
DON JEHLIK



The newest Cox 049 engine sports a black anodized crankcase and tank. The tank is aluminum with top and bottom vents. The vents work the same as those in tanks commonly used in large stunt planes. The vent protruding from the top of the tank ends in the bottom of the tank. The opposite is true of the vent protruding from the bottom of the tank. In flight this means that, no matter whether the engine is right side up or upside down, one vent will blow air into the airspace above the fuel. This also helps to keep the fuel from foaming in the tank.

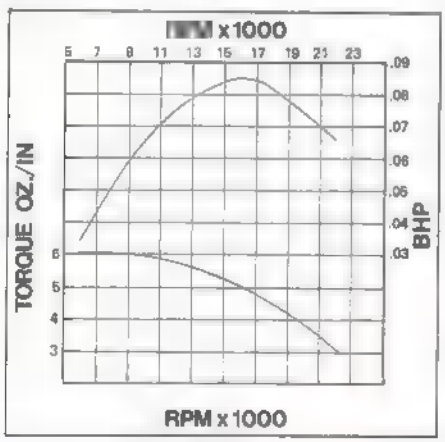
This engine has two bypass transfers instead of the single transfer usually used in Cox reed valve engines. Consequently, the Black Widow produces more power.

Break-in procedure for Cox engines is probably understood by more fliers than for any other engine: start the engine and fly it! The manufacturer recommends a brief break-in, but it is well understood that Cox engines are ready to use. Is the break-in necessary? The engine itself determines this. It just won't run full bore at first. It will lean out to a high four-cycle run, and if the needle valve is leaned further it will sag and drop power. As the engine is run more, leaner needle settings can be used and full power is obtained.

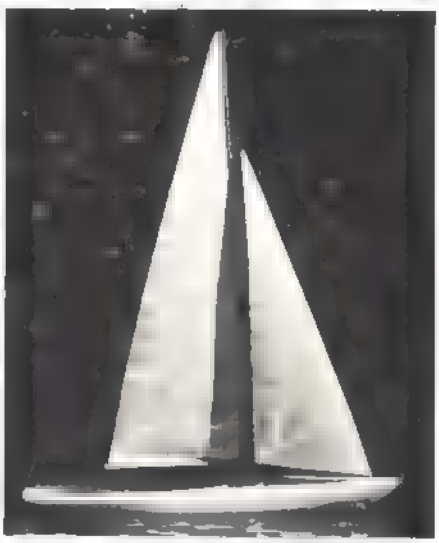
If you intend to fly the Black Widow in a small stunt or combat plane, you should really break it in to full performance before flying. Then it won't let you down during maneuvers.

I ran the test engine on Cox Model Airplane Glow Fuel. The power graph is based on that fuel. If you need more power from your engine, use one of the Cox fuels with a higher nitro content. Rpm can increase by 1000 rpm with a high nitro fuel.

Price & tested—$9.00; Manufacturer—L.M. Cox Mfg. Co., Inc., 1505 E. Warner Ave., Santa Ana, Calif. 92705.



SOLING M
ED SWEENEY



Since I am not really a model sailboat enthusiast, it took me almost a year to get started building the Soling M kit. A year of enjoyment was wasted. The kit was easily assembled by following the well-written and complete instructions. There are no tedious steps in construction of this boat. The kit comes with a fiberglass joined and finished hull, and a separate molded fiberglass deck. The sails are totally completed ready for rigging. All fittings and rigging material are supplied.

Construction is a matter of installing the rudder post, sail control unit (available also from Vortex), radio tray platform and servo mounts, then epoxying the deck on the hull. This particular step is tricky; two workers are needed to do the job properly. The rudder is aluminum and can be polished or painted, but the keel is solid heavy iron (this year Vortex is changing this to fiberglass and lead). Finishing the keel was accomplished by shaping with a metal-working rasp and file, then polishing to a luster. The instructions recommend painting the keel. The mast and boom are supplied as rectangular cut-to-length hardwood. They both must be shaped with a plane and sanded to final contour. The instructions recommended that these be given two coats of spar varnish or polyester resin before any coloring is applied. Instead, I simply painted one coat of Hobbypoxy 2 glue on the spars. This is fairly thick epoxy glue, so it was thinned slightly by adding a small amount of rubbing alcohol to the mixture. When hardened, the spars were final-finished by a vigorous rubdown with steel wool. Beautiful natural wood grain finish results.

I was surprised by the simplicity of the rigging instructions. I had been told this was a difficult step in the construction. Rigging took only three hours of easy work.

A great feature of sailboats like the Soling M is that, with the keel and rigging removed, the hull can be repacked in the kit box for easy transporting as one's personal luggage on an airline flight. When finished, I brought the model with me on Christmas holiday to Miami, Florida, to be sailed in the ocean at Biscayne Bay (yes near the President's Florida home).

The Soling was sailed in every weather condition from near calm to 30 knot winds. At the end of the vacation, the alkaline receiver batteries were absolutely dead from all the fun we had with the boat. This Soling really moves out. It is faster than most full-size boats in winds up to 10 knots! At all points of sailing, into or before the wind, the Soling keeps her heading without skipper corrections. It is that well designed!

By the way, a Royal Electronics two-channel Appolo radio was used. Its wheel control, with trim for rudder and lever for throttle, were adapted perfectly to the Soling.

Specifications: Length—50"; Beam—12"; Sail area—798 sq. in.; Price & tested—$125.00; Manufacturer—Vortex Model Engineering, 210 East Ortega St., Santa Barbara, Calif. 93101.

TOP FLITE P-39 AIRCOBRA
DUANE LUNDAHL

The P-39 Aircobra is the third in a series of stand-off scale fighter aircraft of WWII from Top Flite Models. The kit includes all the hardware necessary with the usual exception of wheels and fuel tank. Construction is entirely of balsa with preformed plastic engine compartment cover, canopy (which includes the airscoop and part of the turtledeck) and engine exhausts. The plans are excellent and construction methods are conventional and straightforward. The balsa included was excellent and die-cutting was good. Everything fit well.

The full-size P-39 had some unconventional features which, because this is a scale model, affect the model also. The engine of the P-39 was mounted at the aircraft CG (behind the pilot) which results in a nose moment nearly as long as the tail moment. Because of this you may have trouble balancing the model unless you plan ahead. However, with the radio gear well aft for balancing, the forward fuselage is now totally empty in the pilot compartment area. If you wish to make the effort, a complete scale pilot compartment could be built in. Another advantage of the long nose is the simplicity in installing retractable gear. The retracted nose gear is well ahead of the wing leading edge, allowing a normal wing installation. Also, because this is a scale plane, the fuselage is much larger (relative to the wing) than a typical RC pattern ship.

My model has Goldberg retracts operated with Sonic Systems pneumatic actuators. Flaps were also added on the full-scale plane. The plans show an optional flap installation. However, they suggest that the entire trailing edge be dropped. The P-39 used flaps which dropped from the lower surface only (the top surface was fixed) and this is how I did it. 1/16" ply was used for the flap surface. Care must be taken to make sure they close tight against the wing and are not warped.

A word of caution: The kit is designed with about 2°-3° of positive incidence in the wing. The first flight of my model was hairy to say the least since the positive incidence caused the model to want to climb radically. The plane was carefully measured to insure its adherence to the plans and, when verified, I decided the only solution was to reduce the positive wing incidence. The leading edge was dropped 3/16" and now she flies great. The plane is very stable, fast (powered by a Supertigre G-60 Bluehead) and looks absolutely fantastic in the air. There really is an extra thrill in seeing a scale model fly, and in the admiration a model like this draws from your peers.

The plane is finished with the new flat MonoKote which I can't praise highly enough. Everyone who sees the plane has a hard time believing it's not painted. I used a heat gun and soft cloth to apply it to the fully sheeted wings, and not a bubble or scratch mars the surface. The plane is decorated identically to the Karlstrom three-view which was published in the Sept. '73 issue of AAM.

In summary, a most pleasant project; if you build one, you'll find the effort most rewarding.

Specifications: Wingspan—60"; Area—630 sq. in.; Prop—11 x 7½; Engine size—60 Supertigre Bluehead used; Fuselage length—51⅛" (incl. spinner); Flying weight—8 lb. 4 oz.; Construction material—all balsa; Price & tested—$52.50; Manufacturer—Top Flite Models, Inc., 2635 So. Wabash, Chicago, Ill. 60616.

DUMAS HI-PRO
STEVE KRANISH

The Dumas Hi-Pro is ■ balsa and fiberglass open class thermal sailplane. It is substantially different from the glider presented in this magazine several years ago (authored by Harley Michaelis), but still retains the good performance.

The fuselage, built from a fiberglass shell which is provided as two halves, must ■ joined with the fiberglass tape using polyester resin. It is not really ■ difficult as it seems. There are no bulkheads or formers. The wing mounts are laminated from plywood, encasing bent fiberglass tubes. The fin is built up from balsa and plywood, and carved to shape. I finished the fuselage with polyester resin and painted it with auto touch-up paint.

The canopy is attached to a balsa frame and held in place by a dowel in the front and a spring-loaded pin in the rear. My canopy came partly crushed, and had taken a "set" in this condition, so I heated it in hot water to return it to its original shape. A simple one-position towhook is shown ■ the plans.

The wing is ■ standard D tube with two heavy balsa spars. All sheeting, spars, etc., must be spliced at the taper change. The TE is shaped and notched, but must also be carved to taper it in thickness. All sheeting is cut from sheet stock, which was of only adequate quality. Matching the sheeting to the LE was quite difficult, ■ the LE itself came slightly warped. The ribs come die-cut but unmarked. The first few ribs have plywood doublers to reinforce mounting of the two fiberglass wing pin tubes. Rubber bands running through the fuselage between opened screw eyes on each panel hold the wing in place on its steel pins.

The stabilator is built up from ■ uncarved LE, TE, and a tapered spar, all of which must be trimmed by the builder. Brass tubing is installed to accept the pivot and control pins, and to set the dihedral. The structure is quite flimsy until it is covered, when it is adequately strong and very light.

I covered all flying surfaces with transparent Solarfilm, of which I used slightly more than one roll.

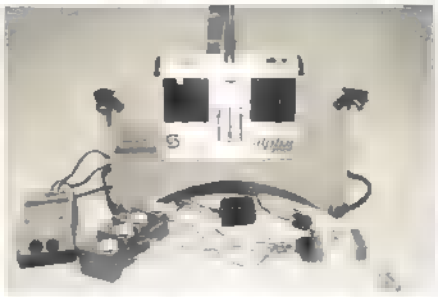
The radio is installed as far forward as possible, and a 475/500 mah square pack fits right into the nose. My installation with an **AAM** Commander required about three oz. of lead to balance properly. I made pushrods from fiberglass rods, and found that both could be removed after assembly.

Flying was done from a 500-ft. hi-start. Flights of 2.5 minutes were made in still air, and of over 10 minutes with thermal help. It is a good flyer, but is difficult to turn, especially without sufficient noseweight. More dihedral would also help.

The instructions are adequate, although the drawing of the front of the fuselage is useless, because several things are shown in the wrong place.

Specifications: Wingspan—101"; **Area**—613 sq. in.; **Fuselage length**—47"; **Flying weight**—41 oz.; **Construction material**—fiberglass fuselage, balsa wing and tail; **Price as tested**—$39.95; **Manufacturer**—Dumas Products, 790 South Park Ave., Tucson, Ariz.

SIMPROP ALPHA 2007
JIM McNERNEY



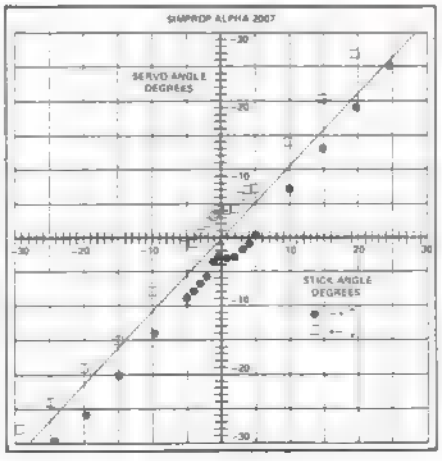
TRANSMITTER: The transmitter box is brushed aluminum with molded plastic sides. The shape is attractive, with the antenna protruding ■ about a 25° angle above the horizontal. This provides an optimum radiation pattern, whether the transmitter is hand held or installed in the Simprop "Assistant" harness and tray assembly. The four primary functions are on two sticks, with the three auxiliary functions on slide levers mounted below and between the sticks. The meter indicates battery output under load and not RF output. The transmitter power ■ a stack of ten 500 ■ah DECAs with a nominal 12 volt output under load. Conventional closed gimbal sticks are used with metal balls and mechanical trim. The encoder is mounted on the hinged back cover of the transmitter. Trimpots for throw and centering adjustments ■re easily accessible. The RF board is mounted inside the top of the case. Plug-in frequency crystals are also featured for Tx and Rx. Discrete components ■■ used throughout.

RECEIVER: The seven-channel receiver has the decoder components contained ■■ two hot dip units mounted on the p.c. board. The RF section has a shielded antenna coil, mixer and three tuned stages of IF. The tape holding the case together has ■ legend showing which plug is the battery connection. The decoder is a three-wire system. A DPDT switch is used to connect ■ compact 4.8V center-tapped DECA battery pack.

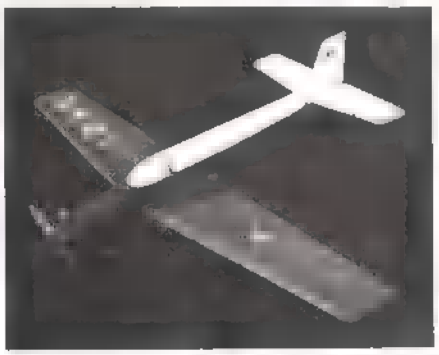
SERVO: The standard servo is about the size of a KPS-10 but narrower since it accommodates ■■ 16 mm Mitsumi motor. The power train starts with ■ nylon pinion gear, then drives through five ■■■ stages of ■■ring instead of the usual four. This slows the transit time slightly, but improves output torque. The retract servo is quite large, ■■■ suring 2-3/16 x 1½ x 1-3/16", plus ■ motor housing which is 11/16" in diameter and 3/4" deep, protruding from the bottom. The 16 mm Mitsumi motor is used in this servo also, but is bolted to ■ 4:1 planetary reduction

Specifications: Pulse Width—1.7 ms ± .5 ms; **Pulse Repetition Rate**—~ 52 per sec.; **Trans. Power Input**—142 ma ■ 12 V or 1.7 watts; **Servo Transit Time**—(stop to stop) std 1 sec.; retract 8 sec.; **Servo Thrust**—std, 22 in. oz.; retract, 40 in. oz.; **Temp. Range**—0°-150°F; **Address**—Simprop Electronics, 4834 Harsewinkel/Westf., West Germany.

(Continued on page 91)



SUPER CUDA
PAT MURPHY



The kit reviewed ■ the Deluxe kit with the balsa wing skins and fiberglass wing tips factory installed. The fuselage is factory joined fiberglass with ■ white gel coat. The firewall is cut to shape, but not installed, so the modeler can set it to the correct depth in the fuselage for his motor and mounting system. The fuselage was ■■ straight as I have seen but did require extra sanding to get a glass-surface-look ready for painting.

Barndoor ailerons are used with the torque rod holes pre-drilled. The ailerons are cut out of the wing and faced with furnished balsa to provide ■ solid hinge point (very easy to accomplish). The balsa rudder and elevators are furnished and cut to profile. They are to be sanded to the airfoil shape of the fin and stab. Foam cores are included for the stab as well as the sheeting for covering them.

An instruction sheet is included that gives the construction sequence of the components, and line drawings are on the sheet to make the instructions very ■■■ to follow. The only dimension not given is the length of the landing gear struts so the plane sits on the ground at the positive angle called for in the instructions. (My nose gear ended up 4-1/8" from the center of the axle from the bottom of the fuse, at 5" back of the backplate. The mains ended up 4" long from the wing skin to the centerline of the axle.

A most pleasant surprise came when I carried the Cuda to the field to test fly. Both the brand new engine (ST Bluehead) and the plane performed extremely well. No trim changes were needed and the engine ran flawlessly. After three tanks of fuel through the engine, I started wringing the plane and found that it will handle the new FAI pattern with no problem (except my capability). The plane will do two rolls straight up without any tendency to yaw out of line. The Cuda slows down very easily for landing and shows no tendency to drop a wing. The Super Cuda is a good airplane.

Specifications: Engine—60 (10cc); **Wingspan**—64"; **Wing area**—600 sq. in.; **Length**—53"; **Weight**—7¼ lb.; **Price as tested**—$94.95; **Manufacturer**—Better Built Airplane Products, P.O. Box 163, Camarillo, Calif. 93010.

getting started in R/C

SEVENTY-FIRST IN A SERIES

HOW MANY CHANNELS?

Jim McNerney

Once you have decided to make the big plunge into RC, an early question you must answer is "How many functions should my radio have?" In order to answer this question intelligently, you should go through a little mental exercise. Unfortunately, as your experience and interest deepens, your goals may change. As your goals change, your equipment requirements may change too. Initially, at least, if you think things out carefully, you can satisfy your requirements for some time. What kind of RC do you want to do? Some general categories here will help sort out your needs. These general groupings are: boats (sail and power), cars, gliders, small (10 cu.in. engine or less) airplanes, medium size sport aircraft, pylon racing, pattern (aerobatics) aircraft, scale aircraft, and helicopters.

In general, boats, cars and gliders require only two functions. Boats and cars require steering and throttle (or, in the case of sailboats, steering and sail control). More sophisticated power boats may have forward and reverse throttle, as well as multiple motors and operating auxiliaries (such as horns, winches, guns and the like). These require additional functions, or "channels". Gliders can be equipped with automatic tow release, or a throttleable engine, in addition to rudder and elevator controls. Flaps, spoilers or ailerons may also be added. These, too, require additional functions.

Small aircraft are limited by their size, and load carrying capabilities, to one, two or three functions. The receiver, switch harness and batteries are required regardless of the number of functions. The additional weight is primarily that of the servo mechanics (1-2 oz. per servo). The very smallest (010 to 020 powered) aircraft can be flown with rudder only, using something like the Ace "Baby" of "Baby Twin" pulse system.

Larger models (049 to 10) perform well with rudder and elevator, or rudder and throttle, using one of the smaller "brick" systems. In these systems, the receiver (and one or two sets of servo mechanics) are contained in a single housing that is easily mounted in the aircraft. Some, but not all, of these systems are small and light, saving weight over systems with separate receiver and servos. Most of the "brick" systems are not expandable past three functions. Most, because of cost considerations, do not provide rechargeable batteries for either the receiver or transmitter. These sets are priced in the range of $100 to $150.

One note of caution: Many of these systems provide two control sticks, each with only one function. For example, rudder is controlled by the right stick, and elevator by the left one. Some people find this very hard to accommodate—they keep trying to pull back on the rudder stick. For these individuals, some manufacturers offer an extra cost (about $10) option of both functions on the same stick. In other words, for a little more, you can get a two-axis stick on a two or three channel transmitter.

"Full-house" systems (four functions or more) provide all the normal controls required to perform precision aerobatics, i.e., throttle, rudder, aileron and elevator. Here, you get into another area of options. There are three basic configurations of full-house systems. Dual stick systems can be Mode I (throttle and aileron on the right stick, elevator and rudder on the left), or Mode II (aileron and elevator on the right stick, throttle and rudder on the left). A third option is a single stick, with aileron and elevator on the stick, rudder control on the top of the stick, and a throttle lever on the side of the transmitter. By far, most of today's sport fliers prefer the Mode II, dual stick version.

Additional functions can be utilized for retractable landing gear, flaps, brakes, dropable stores, smoke, etc.

The more sophisticated radios offer additional options, such as high rate charging for the batteries, master-trainer capability, special harnesses to support the transmitter, dual frequency capability, etc. These are nice to have, but don't really make the airplane fly any better.

Get the most radio capability you can afford. You can use only a limited number of functions at first, but the others are there when you are ready for them.

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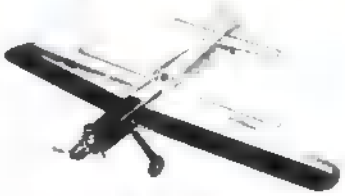

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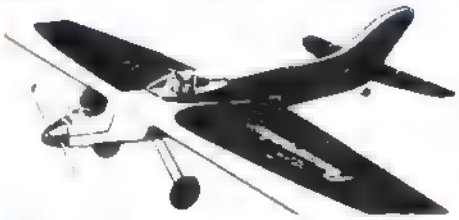

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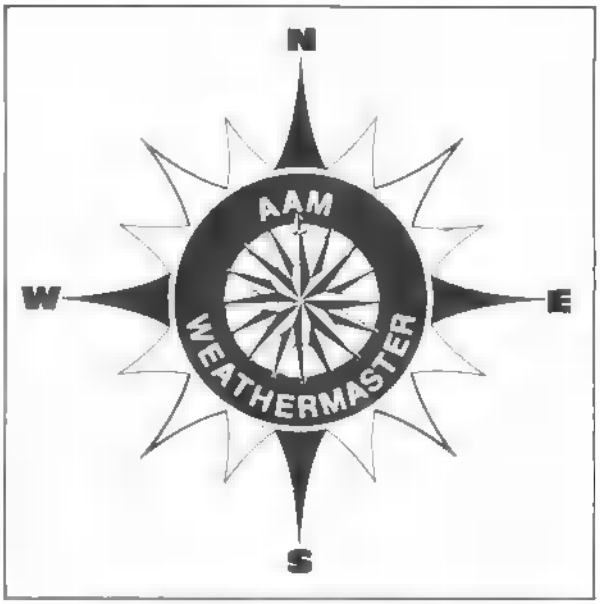


AAM Weathermaster

A HANDY DEVICE THAT WILL ENABLE YOU TO BE YOUR OWN WEATHER FORECASTER. PART II OF A THREE-PART SERIES.

by Hobie Steele

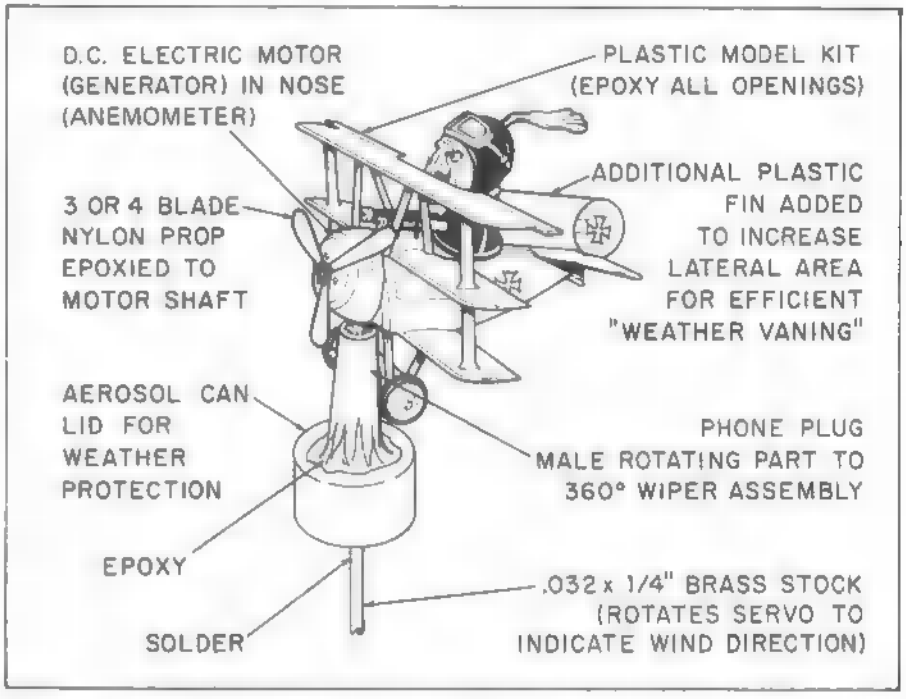
Last month we looked at some of the weather signs we could use to decide whether to make the trek to the flying field or not. Now, let's look at some of the instrumentation we can use for our forecasting.

For years, I have wanted a remote reading anemometer and wind direction indicator. Combine these with an aneroid barometer, and short term weather forecasting becomes a snap. Commercial units with these features were too expensive ($100 up) and much too complex. I have looked for a simple and effective way to build instruments like the fancy commercial units from low-cost parts, which could be found in my workshop, or liberated from one of my friend's goody boxes. After a heap of trial and error, and help from a couple of scientific types, I've come up with the unit described here.

Cloud formations, barometric pressure, wind direction and velocity are the variables with which we are most concerned. The AAM Weathermaster weather station, which can be inexpensively constructed of readily available parts, will provide all the information needed for short-term weather forecasting. It contains everything necessary, except, of course, a window for observing cloud formations, for which you must make your own arrangements!

Although it is possible to build your own barometer, commercial units with sufficient accuracy are inexpensive. Sears and Wards have aneroid barometers, as do many stationery stores and gift shops. I bought a Springfield Instruments barometer from a discount boating supplies mail-order house for less than six dollars.

As mentioned last month, the simplest wind direction indicator is a weather vane on a pole in the backyard. You might locate this outside the same window designated for cloud viewing. It's practically impossible to have a weather vane conveniently visible from a window, yet in a sufficiently open space. Most locations in typical yards are sheltered by trees, bushes or buildings, so it's difficult to get a true wind direction reading from all vectors. The best location is high above obstructions for accurate readings—not only for wind direction, but also for monitoring wind velocity. Ideally, the weather vane should be placed on top of the house, clear of obstructions.



The above assembly can be completely fabricated from bits and pieces found around the house.

Once mounted, how can it be most conveniently monitored? It is inconvenient to hang out a window or run out into the yard. High above the ground, the vane would be difficult to see. I wanted to be able to check wind direction and velocity whenever I felt like it, so a remote reading unit was the answer.

I played with all sorts of ideas to read wind direction remotely. Neon lights or light emitting diodes around 16 or 32 points of the compass (360°) required oodles of electrical contacts. A feed-back arrangement, using a 360° pot, was rejected due to the difficulty of finding parts and the confusion of an indoor meter reading N-E-S-W-N. I wanted a simple way to read wind direction from any vector on a 360° monitor, like a compass, so I decided on selsen servos. A pair of these servos, actually synchronous electrical motors, have this interesting habit: one drive shaft follows exactly the rotation caused by any outside force on the other servo's shaft. The only connection is electrical, so one servo can be placed anywhere, on top of the house, for example. The shaft of the slave servo will follow the master's rotation precisely, wherever you choose to monitor it: in the living room, workshop, or in a fallout shelter. Only five wires connect the two units.

Selsen servos are available in all sizes and shapes. Unfortunately, the 120-volt, 60-cycle version is almost as large as a quart paint can, heavy as the dickens, and expensive. Much smaller units (1"

dia. ■ 1-1/2" overall) are available through surplus electronic sources for two to five dollars each, but are designed to operate on 26 volts, at 400 cycles. I was prepared to work out an inverter to obtain this high frequency voltage, when Walt Good told me he had been using a pair for some time on 12 volts, 60 cycles—so I tried it. Although they didn't have the power they might have had at optimum current, they tracked quite well, and they didn't seem unhappy with lower voltage at a considerably lower (house current) frequency. They did get warm, but if only turned on for short periods to monitor wind direction, that is no problem.

Acquire a pair of these small seisen servos. Mine originally lived in a Control Data Corporation No. 915 optical scanner, which had been cannibalized by a surplus electronic supply house. Military aircraft servos should work quite well, and I have seen them with ■ remote compass rose on one motor, which would be great for our purposes.

Cut a piece of 1/2" diameter dowel 3" long. Drill a hole in the center of one end to snugly fit the shaft of the servo (see Figure 1). Drill two 1/8" diameter overlapping holes in the other end of the dowel about 1-1/2" deep. Epoxy two short pieces of 1/4 ■ .032" brass stock on either side of this hole, as shown in the drawing. Space them just far enough apart to allow ■ 1" long piece of the same brass stock to fit into the slot left between them without too much "slop". The other piece of brass stock will act as a sliding joint and rotate the servo shaft. Tape these carefully until the epoxy hardens. Epoxy the other end of the dowel to the shaft of the servo. Align it carefully to avoid wobble, and be sure you don't get any glue in the bearings. Put this assembly aside.

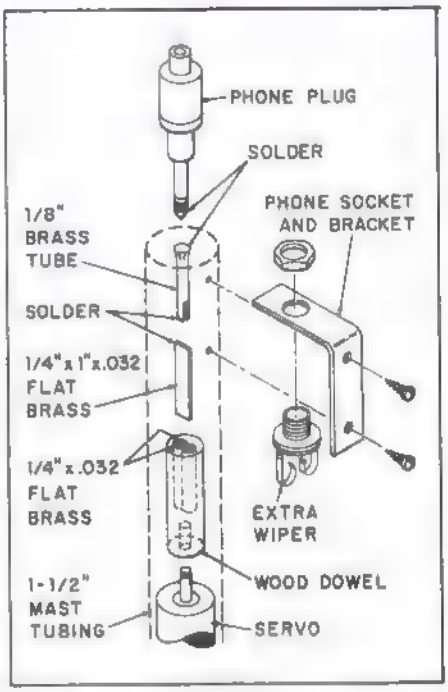
The anemometer (wind speed) generator requires rotating electrical contacts, and a bearing which is easily built of readily available components. I used a Lafayette open circuit phone jack 99-62135 (socket), and a Lafayette volume control adapter plug 99-00994. An Allied 274-1539 Universal 1/4" Phone Plug works as well.

The bearing/wiper assembly is an ordinary phone jack socket with an extra contact formed of 1/4 x .032" hobby brass stock, bent to match the one integral to the socket. This will permit sufficient freedom for easy rotation of the weather vane, and also assure good electrical contact at all times. Bolt this extra contact to the socket with ■ 2-56 bolt, as shown, and solder it in place for additional security.

Now place the plug in the socket and adjust both contacts so the plug snaps in securely, but can rotate freely and easily. Bolt the jack into ■ hole drilled in a piece of hardware store angle bracket. When the bracket is screwed to a piece (3' or so) of 1-1/2" galvanized TV mast tubing, the hole should be in the center of the tube. Don't fasten the bracket to the tube yet.

Unsnap the plug from its socket and set the socket and bracket aside. You will note that the Lafayette plug is in two pieces, with a volume control inside. Carefully remove the top part, then disconnect the volume control wires. Solder ■ 6" wire to each of the plug's lower (pointed end) terminals. Feed the unfastened end of the wires through the small hole at the top of the plug, re-assembling the top and bottom halves of the plug.

Now razor-saw two cross-slots, about 3/32" deep, in one end of a 1-1/2" long piece of 1/8" diameter brass tubing. Cut one slot across the other end of the tubing, about 1/4" deep. Flare the end with the two cuts to fit over the point of the volume control adapter plug. Spread the other end of the tubing so that the piece of 1/4 x .032" brass stock can ■ forced into the slit. Solder the flared end of the tubing to the point of the plug as shown, being careful not to short out the point of the plug. Now solder the 1" long piece of 1/4 ■ .032" brass stock into the brass tubing. Align this assembly carefully. Later, it must be fitted



"blind" into the slot in the dowel of the servo shaft.

The entire assembly you have just built must fit through the hole (bearing) of the phone socket on the angle bracket, so try it and file slightly, if necessary. You might put a *small* amount of epoxy around the lower end of the plug's shaft where it meets the point, not allowing any glue to get on either of the electrical contact points. Epoxy the plug case securely at all points which might work loose, so you won't have to make any more trips to the roof than necessary.

I went through a heap of ideas for the wind vane/anemometer, including one with digital to binary conversion electronics, which worked fine; but it was more Mickey Mouse than retractable landing gear on Galloping Ghost! I wanted something workable, using the K.I.S.S. method: Keep It Simple, Stu-

(Continued on page 78)

ABOVE: The rotating wiper assembly as it is installed in a simple plywood profile wind vane. A DC motor (anemometer generator) is epoxied to the nose. RIGHT: After the author did all the "hard" work, he allows his wife to do the simple task of hoisting the completed Weathermaster into position ■ the roof. Where do guys get such considerate wives for projects like this?

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Phony Folkerts

The next time you get fooled [illegible] the FAI circuit, it could be by [illegible] real phony. Although its looks are somewhat fake, its speed around the course is for real. / by Bob Root

The other half of the Root [illegible]cing team, Kathy, with the Phony Folkerts. (Photo by [illegible] Reed)

In deciding to build a competitive new FAI racer, the design requirements seemed to suggest [illegible] minimum sized "thing" configuration. However, I have always felt that model racers should look like full-scale airplanes. The model presented here [illegible] the Phony Folkerts represents a compromise between these extremes. Although the model retains some of the basic outlines of the Folkerts SK-2, and SK-3, it cannot be suggested that it is stand-off scale, unless one stands off 400 feet to watch it race.

However, racing is what this design does best. It has been quite competitive in the Northwest in FAI, and finished well at the 1973 NATS, with Jim Booker and Bob Root placing third and fifth respectively.

The Phony Folkerts fuselage cross section was minimized for low drag by designing the basic fuselage to be just large enough for the necessary equipment. The FAI width and height requirements were then faired into the small cockpit area [illegible] smoothly as possible. A fiberglass fuselage was incorporated to minimize structural volume, while allowing complex curvature and rapid construction. Although this type of construction deviates from the author's usual methods of wood construction, the results have proven worthwhile. A high quality, lightweight, fiberglass fuselage is now readily available.

While the design and construction of the original plug, mold, and model took all winter, the second [illegible] was built in two weeks by fellow competitor Jim Booker. The fiberglass work and much of the original plug and mold building techniques [illegible] supplied by Tony Howard. He has been producing high quality, limited production, fiberglass kits for several years. Either [illegible] glass fuselage, or a complete kit, is available from Miniature Aircraft Designs. See details at the end of this article.

A few notes [illegible] included for those who may be interested in building a wooden version, but the equipment room or the cross-sectional area will have to be compromised. The complex fuselage shape does not lend itself well to wood construction.

Construction is shown for four separate types of landing gear. Violett Aero

Although prohibited for World Championships and FAI International Contests, the tuned pipe is interchangeable with, . .

an "effective silencer," i.e., a Mac's muffler.

Modeling Corp. retracts were used on the original model. Although this plane weighed less than 4-3/4 lb., very careful building was required. A separate article on installation of the retracts, with details of the full wheel doors, appears in this issue of AAM.

Jim Booker built his model with belly mounted wheels and "outrigger" stabilizing skids. This landing gear is simpler and lighter than retracts, but not as realistic. Jim has successfully flown this model without the skids, but the minimum skid length required for reliable takeoffs has not been determined. They shouldn't be too long, or they will cause excessive drag during takeoff.

Typical balsa fuselage cross sections are included on the plans as an aid to wood construction. A sketch of one possible building method is also shown. The curved upper and lower parts of the fuselage can use planked construction or formed balsa blocks. Form the engine compartment with balsa blocks or epoxy and fiberglass covered foam blocks.

If the above is not too clear, it is suggested that the reader refer to the author's Firecracker FAI racer article in the January 1972 issue of AAM. A complete discussion of a wooden fuselage is included. If a fuselage is constructed from scratch, it is important to note that the minimum width and height (occurring at the cockpit on this model) must be 3-3/8" and 6-15/16". The basic fuselage is 2-1/4" wide, with the extra width occurring only in the fairing above the wing.

CONSTRUCTION

If a fiberglass fuselage is used, the first step is to file a Tatone No. 3 mount to fit. The front end must be filed somewhat to fit within the fuselage. Depending on the engine, the engine lugs may also have to be narrowed. An H.P. will fit with a minimum amount of material removal. The ST G-40 requires quite a bit of filing.

For maximum adhesion, polyester resin should be used to bond the firewall and bulkheads to the fuselage. Use a fillet of glass matt or micro-balloons, mixed in resin for reinforcement. The front wing mount bulkhead should be drilled for the 1/4" hold-down dowels before it is installed in the fuselage. The mating 1/4" ply plate, which is later glued to the front of the wing, should also be drilled at this time, to insure that the holes match.

However, the aft wing mount should not be drilled and tapped until the wing is completed. Note that the rear wing hold-down is bonded and screwed to the aft bulkhead before installation in the fuselage. A layer of fiberglass cloth on each side of this hold-down will insure that the tapped hole will be durable. If a fuselage mounted landing gear is used, it should be constructed at this time.

The fitted cowl can be held in place with a dowel and nylon bolt, or Cam-Loc. For engines with a large fin diameter, such as the ST G-40, the cowl sides will have to be cut away and refaired near the head. This can easily be done by covering the cylinder with thin cardboard for clearance, and magic mending tape or plastic wrap for protection. A new wall can then be formed over this, using fiberglass, micro-balloons, and resin.

Form the air intake by cutting the outline of the hole in the top of the fuselage, except for a small amount at the front. Push in the aft end of this piece to form the bottom of the intake, and fill the sidewall area with micro-balloons and resin. Carve to shape with a hand grinder, allowing space for the engine crankcase.

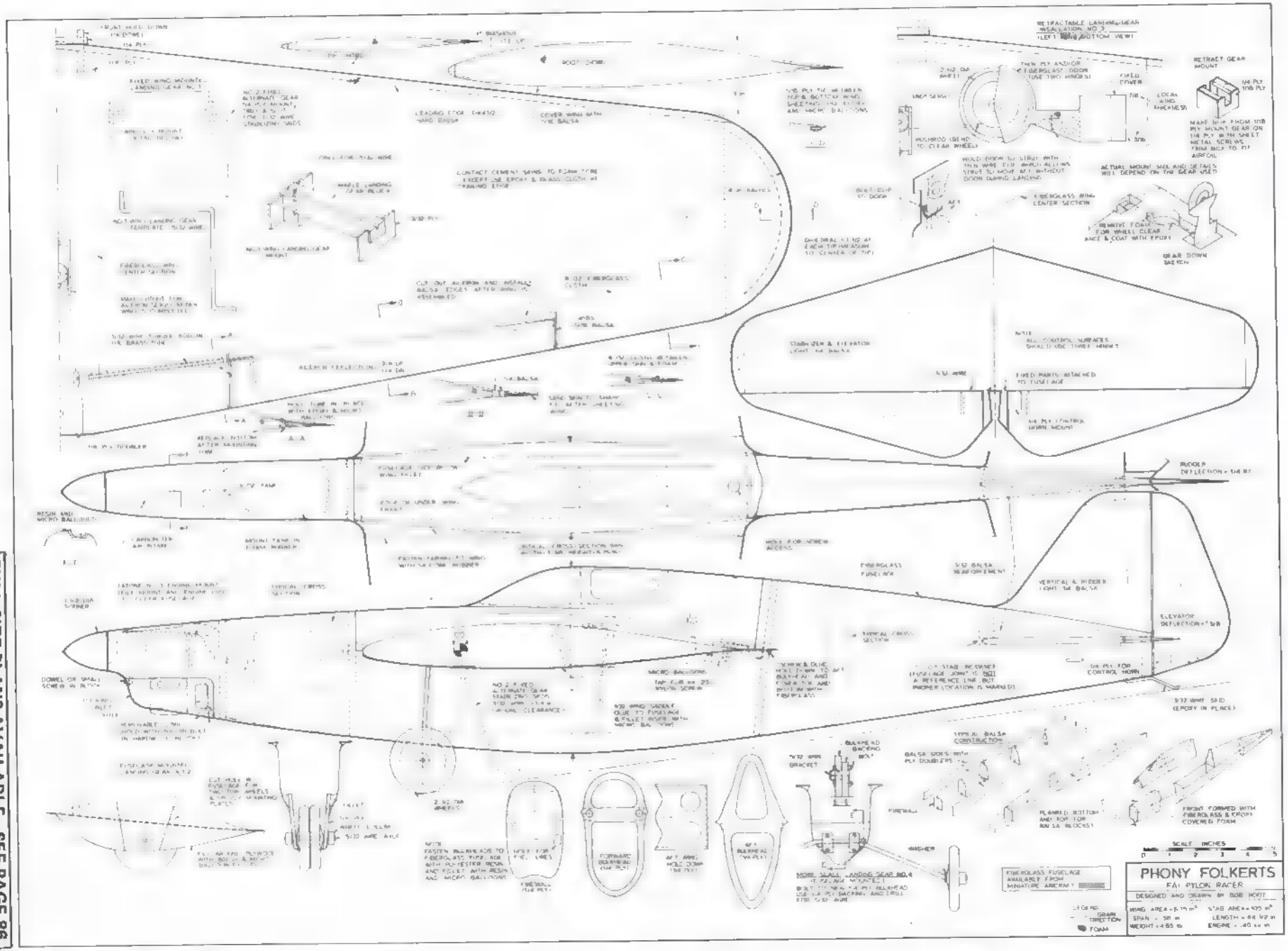
The foam wing construction is different from normal, in that the trailing edge is formed by epoxying a layer of glass cloth between the 1/16" balsa wing skins. The balsa can then be sanded to a thin, strong trailing edge, using the fiberglass as a reference line.

The wing skins should be bonded to the foam with a good grade water base contact cement, such as Southern Sorgham, except in the area of the trailing edge, where epoxy is used. Mark the line separating the cement, and apply epoxy on both the foam and the skin. The epoxy should be applied to the balsa after the contact cement has air dried, per package instructions. Stick one skin to the foam, using care in alignment.

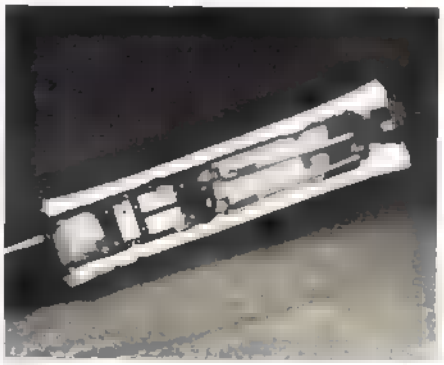
Next, lay the 6 oz. glass cloth TE reinforcement on the foam and skin, and rub to insure that it is wet with epoxy. Add additional epoxy to any dry

The author identifies his racer. White underside gives good contrasting visibility to the black topside. You can really see this bird on the course.

Phony isn't the word for it! The Folkerts bears only a passing resemblance to the short-spanned, long-fuselaged racers which flew to a first and third in the 1937 Greve Trophy races.



Snugly nestled in the front end is the HP 40. This engine is very popular for FAI racing, especially in England.



Fuselage is spacious enough to make even pattern fliers envious. The third servo is for in-flight mixture control.

Jim Booker's Folkerts goes the whole ten yards in an attempt to maximize the FAI rules.

spots, then carefully join the second wing skin, checking alignment to insure no overlap of epoxy and contact cement.

To insure an accurate wing, the skins should be bonded to the foam while it rests in the block from which it was cut. Clamp the wing skins where they overhang the foam block. Use two straight pieces of 1/4 or 3/8 balsa taped together one side, and pinned through the TE on the other. Set weights on the foam blocks to hold the epoxy joint until it has set. Check that the TE is straight.

If wing mounted landing gear or skids are used, the mounts should be added before attaching the skins. Also note the extra three inches of wing skin at the tip. Cut the tip outline from 1/16" ply, feather it near the trailing edge, and bond it between the wing skins outboard of the foam core. Also add the leading edge.

After shaping the leading and trailing edges, cut the ailerons from the wing panels and face them with balsa. A groove should be cut in the bottom wing skins to mount the aileron torque rods. Once these are in place, the balsa which was removed from the bottom be replaced. The wing panels can now be joined. Remember to add the 1/16" joiner near the leading edge.

Attach the 1/32" ply fuselage wing saddle, using the wing (covered with plastic wrap) to achieve the proper shape. Fill the area between the 1/32" ply and the inside of the fuselage with a resin/micro-balloon fillet. Next, mount the 1/4" ply front wing plate against the front fuselage hold-down bulkhead with short 1/4" dowel stubs, which do not protrude into the wing area. Do not use any glue.

The aft 1/8" ply doubler should be added to the wing in the of the hold-down bolt. Then carefully position the wing and epoxy it to the front ply plate. Without moving it, drill the wing and aft mount so that it can be tapped for a 1/4-20 nylon bolt.

When the epoxy is dry, the wing can be removed and 1/4" diameter holes drilled in the wing and the 1/16" ply joiner, jusing the pre-drilled 1/4" ply plate (now glued to the wing) as a jig. Fiberglass the wing center section, including the landing gear area if retracts are used. When this is dry, the 1/4" hold-down dowels can be glued in place. The rear hold-down hole can now be enlarged, and the required aileron and retract servo cutouts and mounts be added.

Mount the wing, and cut a hole in the fuselage fairing to allow screwdriver access to the rear bolt. The fairing can then be bonded to the wing with silicone rubber, while checking alignment with the basic fuselage. Some trimming of this part will probably be required in order to get a good fit.

The tail surfaces should be carved from stiff, but light, 1/4" balsa. The surfaces be tapered spanwise to minimize weight. Bond 3/32" balsa inside the fuselage, to provide a larger surface for the stabilizer fuselage joint. Glue the stabilizer and vertical tail in place, using the wing as an alignment reference. The required stabilizer position is marked on the fiberglass fuselage for zero degree angular difference. Note that this doesn't coincide with the fuselage joint. It is always a good idea to check the angular difference between the tail and wing. Next, hinge the elevator, and glue the fixed root pieces to the fuselage. Micro-balloons and resin or epoxy can then be used for the fillets.

It should be pointed out that none of the polyester resins will harden properly over most epoxy. The exception is that some resin will harden over Devcon five-minute epoxy. Keep this in mind when bonding parts. Don't epoxy if resin will be used over the joint later. This means that, if surfacing resin is used for finishing, the wing and the fiberglass TE is best put together with Devcon five-minute epoxy. If regular epoxy is used, care must be taken not to expose it when sanding the TE.

This completes the basic construction. Solarfilm was used to cover all the flying surfaces of the original model with retracts, in order to reduce weight. Various finishing techniques have been used on later models with fixed gear, while still maintaining minimum weight. No unusual flying characteristics have been noted in any of the Phony Folkerts. With the CG located properly, this a smooth flying configuration.

For anyone interested in building this competitive airplane, fiberglass fuselages and kits are available from Miniature Aircraft Designs, 1318 144th, SE, Bellevue, Wash., 98007. A high quality, 11 oz. joined fiberglass fuselage with fitted cowl and wing fairing is available at $31.50 plus $2.00 postage. The construction kit, including fiberglass fuselage, 1/4" ply bulkheads (four), precision cut foam wing cores, six oz. glass cloth, machined 1/4" balsa tail surfaces, and rolled plans, is priced at $49.50 plus $3.00 postage.

The Phony Folkerts took first and second in FAI at Mexico City, Mexico, over the Easter weekend.

A pair of Folkerts. Jim Booker's (left) looks like a completely different bird than the author's.

Now that's a clean racer. Closing up those wheel wells is worth at least a 25% reduction in drag.

Real Retracts for the Phony Folkerts

by Bob Root

The retractable landing gear installation used in most models suffers two disadvantages, both of which are undesirable in an FAI racer. (1) Retracts usually result in excessive weight, and (2) the open wheel wells cause considerable drag. A typical model retract installation, with open wheel bays, reduces drag by only about 25% of that which can be achieved if the wheels are completely faired, i.e., close-fitting doors.

A fully enclosed retractable landing gear system was developed, in an attempt to produce a realistic FAI pylon racer with less drag than the "thing" airplanes, with their fuselage mounted wheels. The following article describes the installation of Violett Aero retracts in an FAI racer wing. Doors are used to completely seal the wheels when retracted. The landing gear and doors are powered by one 180° servo.

The basic ideas presented here could be used to install other types of gear and actuation systems. However, the Violett gear have the advantage that there is considerable pushrod movement available at each end of the throw, with no gear movement. The method used to drive the inner doors takes advantage of this to get the doors moving ahead of the wheels.

The drawing shows the basic characteristics and components of the system. The servo arm is modified as shown and bolted to two extra arms, with the proper spacing to prevent interference between the four pushrods. The retractable gear pushrods are attached to a 180° servo in the normal manner. The inside door actuating pushrods are attached to the servo at approximately 90° to the retract arms. Therefore, the doors open in the first 90° of servo motion, allowing the wheels to come out. They close most of the way in the second 90° of motion. With the gear down and locked, the doors are almost closed, resulting in good ground clearance.

It can be seen in the drawing that the gear and doors are actually hooked at angles slightly different from 180° and 90°. This is done to insure that the doors are open as the gear extend. If another type of retracts are used, these angles will have to be changed, resulting in more door extension when the gear down.

The outside doors are simply attached to the landing gear struts with thin wire clips, as shown. The strut is then free to move aft in a hard landing, without disturbing the door.

The following method can be used to produce close fitting doors, which match the wing contours. First, the landing gear mounts should be installed in the cores. These are small plywood boxes, per Violett's recommendations. They seem to work well, and they are light and easy to make.

Next, the doors carefully cut out of the wing skins. Mark the location of these holes on the foam cores to aid skin alignment when sheeting. The cores can then be skinned in the usual manner, except that epoxy and six oz. fiberglass cloth should be used in the of the landing gear to bond the skin to the foam.

Care should be taken to avoid overlapping the contact cement and epoxy. The cloth goes between the balsa and foam, for strength around the large wheel cutouts. Don't use more epoxy than necessary, as it is quite heavy. The skins will have to be clamped to the foam until the epoxy has set up. To do this, place a large weight on the foam wing block with the wing inside.

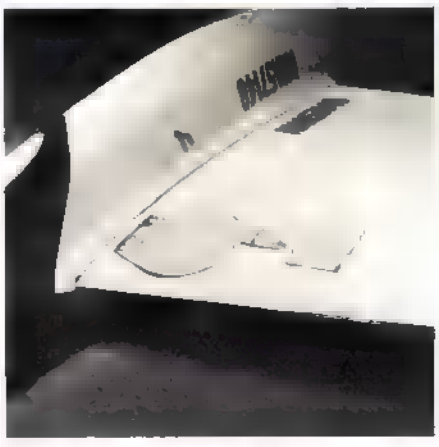
When the epoxy has set, cut out the wheel wells and pushrod holes. Install the gear and put Magic Mending tape over the gear, and on the glassed foam which wasn't removed. This will prevent any resin from sticking where it isn't wanted. Two hinges should be used on each door. Use one wire hinge pin per door. Cover this area of the hinges with Vasoline, to insure smooth operation when finished.

Next, spot-glue the hinges in place with Devcon five-minute epoxy. Now the whole should be fiberglassed with polyester resin and six oz. fiberglass cloth. Cover the doors, hinges, and wing skin. Add extra cloth in the area over the landing gear mechanism where there isn't any balsa.

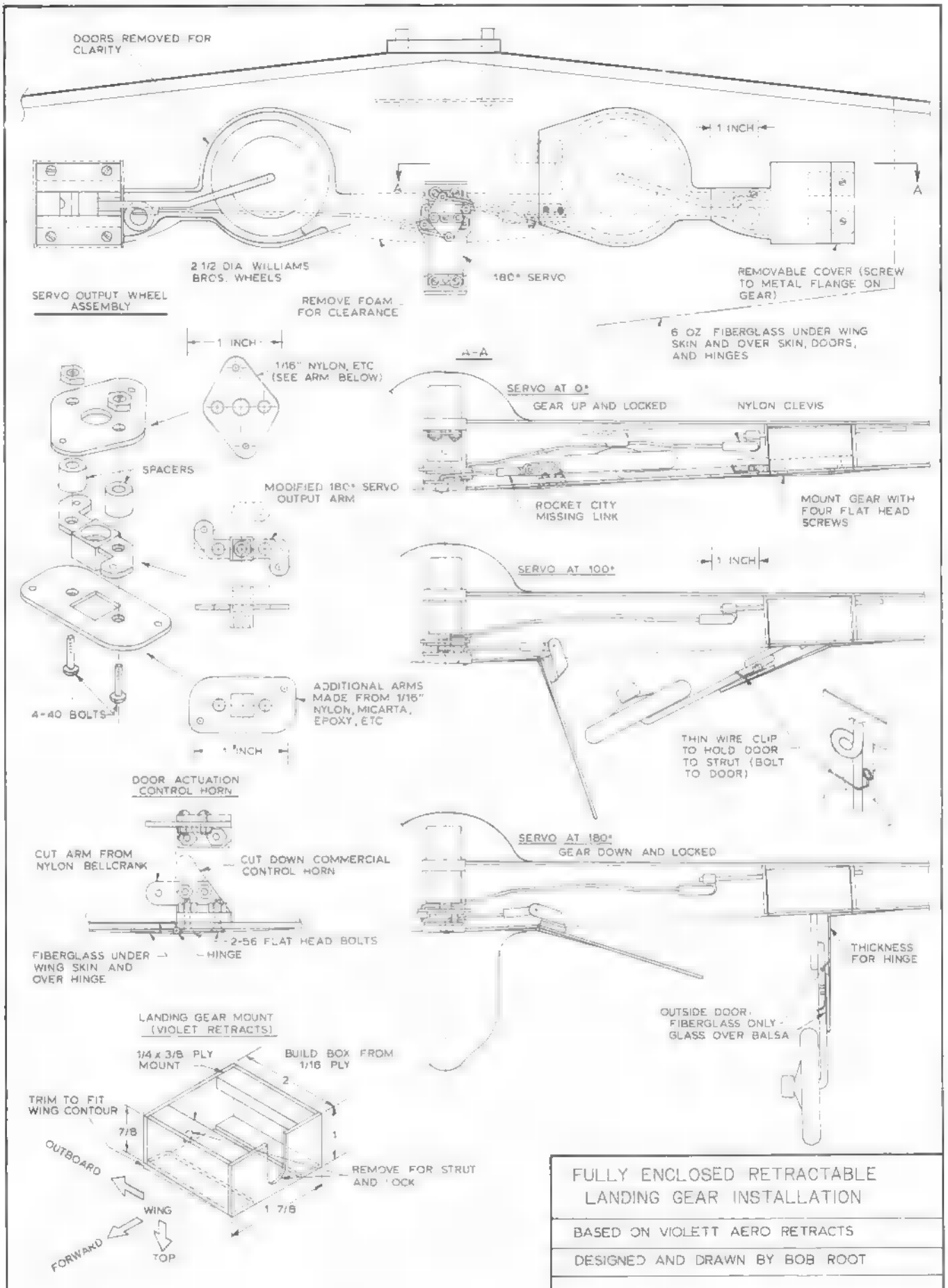
When the resin has hardened, the doors can be cut out. Care should be taken to avoid cutting the hinges. The wire hinge pins can then be taken out, in order to remove the doors. The inside of the doors should be covered with

Plans on following page
Text continued on page 84

Here's how it happens. The cycle sequence is very realistic and quick. In the down position, the wheel doors give plenty of ground clearance.



(Photos by Ron Reed)



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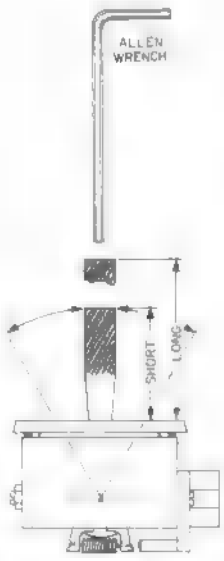

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Avenger

These days, ■ control line stunter has to have not only exacting flight characteristics, to permit a flawless pattern, but also immaculate looks, to impress the judges. The Avenger is ■ point-getter in both categories.
Article dedicated to the memory of Tim Dunlop. / by Don Shultz

The Avenger is the end result of more than a decade of competition in CL Precision Aerobatics. Many of the desirable features of well-known and proven stunt designs have been combined in a model which is tailored to my individual requirements. That is why the design may look a little familiar to many of the dedicated stunt fliers. Simply to program the best features of top stunt planes seems of little value, because there is certainly more to winning Aerobatics than having an airworthy craft. Whether the term be "gamesmanship," or "salesmanship," there always seems to be that rare, elusive, special *something* to ■ winning combination that continues to remain out of reach for the majority of stunt fliers. It simply takes an impressive "out of the ordinary" airplane to win today.

The construction of the Avenger is typical of today's modern contest formulas, and my concept of basic design must be shared with Bob Gialdini, of Wisconsin. He was best known as a top national and international competitor, designer and judge. Who can forget his success story of the mid-60s with his legendary Sting Ray and Eclipse designs? Perhaps this one man has done more to influence today's trends in stunt than anyone I can recall. I've built three Sting Rays over the past years, including my white and gold Rays of the '67, '68 and '69 Nationals. I have received more than my share of wins using this very fine airplane. A few helpful changes from this design influence in the Avenger have been added, to make it a better flying stunter.

I settled on ■ span of 59". I extended the wing chord, fattened up the ribs, changed the wing tips, used thicker 1/4" flap material to fair into the fatter wing structure. I've added ■ ventral fin, for more lateral side ■ aft of the CG. The additional advantages of the fin are: no extra weight gain behind the CG, and extra body strength. The stab placement dictates extra care, but is well worth the "Impression Points." I've streamlined the air exhaust outlets in the cowl with large diameter brass tubing. Even though mesh wire

screening looks super neat in the hot air exhaust outlets, it *does* restrict the airflow. . .so do not use screening! Muffled engines do run well at high temperatures and require all the cooling they can get.

The stab and elevators have been enlarged over previous designs to give less sliding effect in the square maneuvers. This has been perhaps the most dramatic improvement over my past designs, and anyone who has seen this Avenger turn agrees. In ▬ attempt to deviate from the trike gear setups, I settled on the Tall Texan tail dragger. Takeoffs and landings are important maneuvers and more contests have been won or lost by the simple act of getting off and on the ground. It is the introduction and summary of your flight, and "all's well that ends well." Anyway, the landing gear placement shown on the Avenger makes takeoffs and landings virtually a gift!

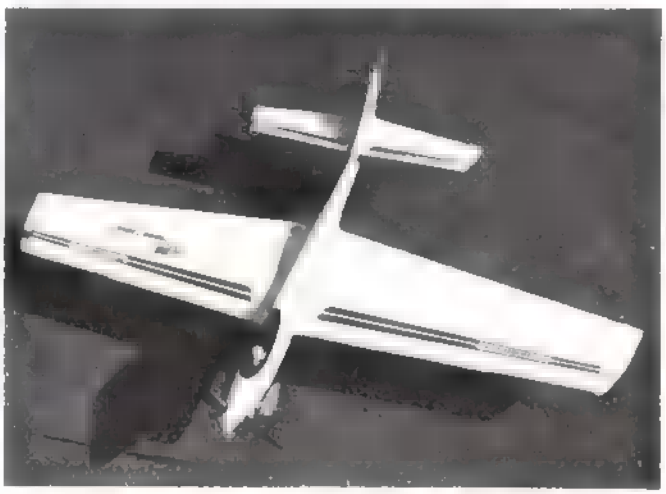
There is very little to be added that hasn't already been worn out by previous stunt articles. However, I would like to re-emphasize these significant facts: overall light weight, perfect alignment, consistent motor runs and properly trimmed airplanes are just part of the combination needed to win at Stunt. Don't be afraid to really fly the "Prized Jewel" (or "Broken Brick"). . .it will never win ▪ contest on its own merit. Practice! Follow consistent procedures, and organize practice sessions so that the pattern becomes an automatic flowing exercise of beauty from beginning to end. Learn to fly conservatively in practice, but always go for broke in competition. It is difficult to remember that the plane has to be expendable during those six to eight minutes of battle. Try to remember why we build these competition airplanes in the first place! Have you ever held back just a little while flying the pattern, and then wished you had gone for that extra effort. . .after seeing that you narrowly missed the Big One on the contest scoreboard?

The Avenger is a large airplane for a 35 engine, so keeping the weight in bounds becomes quite important. Stunt engines larger than a 40 demand heavier lines, which is like using chains for flying wires. There ▬ many good stunt engines on the market today and choosing the right one for your design isn't a problem. I've been using the very well known OS Max 35 stunt engine for the past few years, and I found it more than satisfactory for ▪ 35-sized stunt plane in the 45-50-oz. range. It has plenty of power, and swings a larger prop with ease (try an 11 ▪ 5, or a three-bladed 10 x 6 or 9 x 6.) Six and a half oz. is light for an engine and, furthermore, the Max is ▪ precision-made little jewel. Try it, you'll. . .(Ugh! I can't finish that quotation.)

I've found it desirable to further restrict the air intake of the Max by press-fitting ▪ K&B 35 stunt restrictor inside the standard OS insert. Secure the fitting with epoxy and file smooth. This modification takes an edge off the brute power, but improves the fuel drawing ability, and adds to the fuel economy. As a result, 3½ oz. of fuel will complete the AMA Stunt Pattern, with time to spare. If you're lazy, like me, you will find the Testors McCoy brand is now the cleanest burning, and the gooey oil wipes off easily. Make certain that it's their latest "Clear in Color" formula, and not their older greenish-blue fuel, which would cause an alarming carbon build-up, rusty tanks and corroded landing gears. I would have liked to know what was in that caustic brew? Never fear, you can identify this batch of fuel by the unusual geranium flower smell reaking from your old greasy flying rags!

I've become ▪ real muffler freak and wouldn't be without one. Remember also that muffler pressure aids a smoother engine run. One other advantage is back pressure, which I feel helps keep the fire lit, by providing higher engine temperatures. One big word of caution! Keep those overlean runs to a minimum (hopefully less than one), or the result could be a destroyed engine.

I would recommend one modification to the old style Max muffler, to further insure cooler operation and faster restarts. OS supplies two "O" ring restrictors, one for the inner baffle and one for the exhaust outlet. Grab the trusty



ABOVE LEFT: Long, lean and lovely. High aspect ratio wing and stab accentuate the thin fuselage. Moments and areas offer smooth, tight cornering. The Avenger has the sculptured lines of a winning stunter. The design emphasizes not only reliable performance, but also those bonus impression points. ABOVE: Some of the details needed for impression points. Brass inserts dress up the air ducts. The pressure vent is shrouded by a fairing. A polished muffler helps, while the painted prop matches the tinted canopy. LEFT: Author fires up the trusty Max 35 for a practice session, while fellow flier Bob Emett pits. Text tells how to get those first flip starts every time. RIGHT: Mrs. Carol Shultz adds a pleasing touch to the Avenger. You can never tell just what the judges are looking at when they give those impression points!

grinding attachment for the Dremel, put on the protective glove and eyewear, and proceed to ream out the opening in the exhaust stack attachment area to the very limit. Also remove all inner baffles, leaving only the outlet ring for appearance.

It would appear as if we have killed the quieting properties of the muffler. Not really. While a slightly louder exhaust note is apparent, we have effectively taken the sharp, cracking sound out of the exhaust note. Outside the flying circle, the noise level is only slightly louder than that with a standard muffler. I strongly feel that the flight pattern appears smoother, simply by making a quiet, soft sound reflect the visual grace of the maneuvers. Learn the use of a muffler, and I think you'll never be without one again. Once you learn the starting procedure with a muffler, you'll never be short on those extra starting points.

Here is my starting procedure when using a muffler. First, never fill your tank before carrying the plane to the starting line; otherwise flooding can result. Set the airplane down, and unplug the overflow vent and muffler pressure tube. Fill the tank with a bulb that allows one full tank, per squeeze. Fill until overflow vent yields a steady spurt of fuel (how wasteful!). Cap the overflow vent, and keep filling, until fuel just starts to bleed from the air intake. Quickly remove fuel bulb tube from fill pipe, without letting it siphon back. Reattach the muffler pressure tube, and attach the battery clip and choke off air intake with your finger. Turn over the engine for two or three flips, but keep a firm grip on the prop. Now stop choking the intake, and continue turning over the engine with a firm hold on the prop, until a sharp kick of the prop is felt.

How professional you are going to be with that first-flip start! Signal the judge, and let her rip! I've rarely flooded an engine this way, and I always get those first flippers. These are so badly needed for those mighty impression points. The real beauty of this starting procedure is that an exhaust prime is absolutely not necessary! This means no raw fuel all over your shiny stunter to cause botched paint jobs and the much-dreaded "fire in the hole!" Talk about hanger rash!. . . UGH!

CONSTRUCTION

Do your own thing, and build what you like first. I build the wing first, because this is what usually "blows my mind," and it seems the hardest task of all. Cut the root and tip rib templates from aluminum, Formica or 1/16" plywood. Make a sandwich (not chicken salad) with 27 blanks of 3/32" contest balsa, between the templates. Make certain both center section ribs are hard RC quarter grain wood, for proper strength during those over-industrious pull tests. I've yet to damage a model in this manner; however, over the years I've seen many pull test "accidents". . .and the next one could have *my* number on it.

Get out that carving knife, and proceed to bravely hack and sand one set of ribs to shape. Clean the sawdust from your runny nose and repeat the process for the other wing

Check for leaks by submerging the fuel tank. Remember to exhale, not inhale.

panel. Disregard the bevel left on the rib edges; these will be trimmed during the final sanding of the wing. Take extreme care in cutting and setting up the wing jig alignments. Measure very carefully to insure a perfectly aligned wing.

I prefer a nylon bellcrank. No bushing is required if 1/16" brass tubing is used over the leadout cable, as shown on the plans. Secure the flap horn to the trailing edge of the wing to insure long wear for the nylon hinges. I've found that, if the hinge line is carefully aligned, and the hinges are pre-drilled and roughed up with coarse sandpaper, the hinges will not loosen with time. It is not necessary to use pegs in the hinges. These have a tendency to show through after a period of time, due to shrinkage of the dope finish.

Use the method of bushing you prefer in the control horns and, by all means, at least use brass, teflon or nylon bushings of some kind! Lots of practice puts unbelievable stress on these small, but highly overworked, control linkages. Take care in bending pushrods, as any misalignment here can cause a wobble, which in turn, causes wear. Also use a long-lasting lubricant or silicone grease. I've seen a 100-year-old Nobler give excellent long-wear bearing service. Big Deal. . .who wants a 100-year-old Nobler anyway? Would you believe, 12 years old?

In the Avenger, I decided to go all out and install ball-bearing controls. They have the added advantage of extremely free control movement and life time service. The cost of bearings is high, but if careful shopping is done, quite adequate bearings can be bought at your local "going-out-of-the-slot-car business" dealer, starting at about $2.00 each. With six bearing locations, the cost is reasonable. In my first Avenger, I used epoxy to hold the bearings in place, and the latest version used solder. Both methods of securing the bearings worked very adequately, but make the bearings a press fit for added insurance.

Now the fun begins with the fuselage. Cut the 3/16" light, straight-grained balsa sides, and laminate the 1/16" plywood doublers. Also drill lightening holes in the maple motor mounts, and shape them as shown on the plans. Lighten the doublers in a similar manner.

Prepare your favorite type of fuel tank. I modified a Veco tank into a uni-flow system, as shown on the plans. After your tank is complete, boil the tank in water and *carefully* check for leaks. Do this by blocking off all vents, except one, and hold the tank underwater. Force air into the remaining

Soldering linkages takes a steady hand, and occasionally a foot or two.

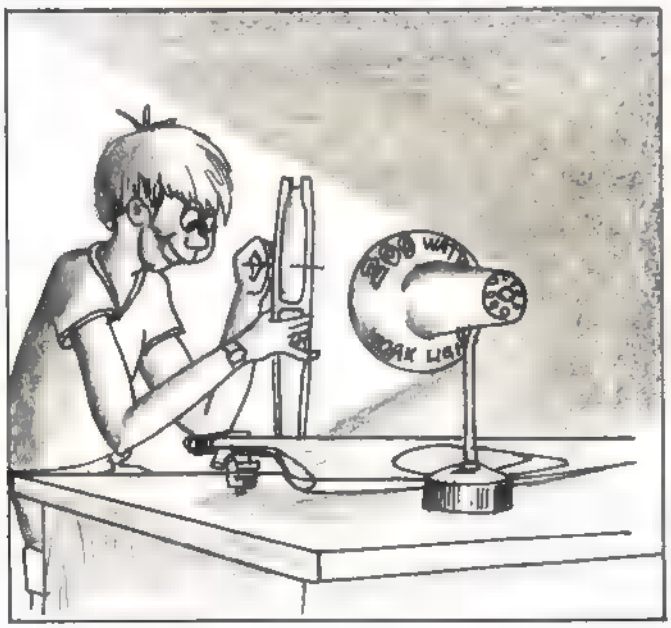
vent with a fuel syringe and hope you don't see any air bubbles. . .bubbles are for beer! If you see bubbles, then you'll probably need that beer. I find making tanks a terrible chore, and I wish someone in the hobby industry would make a good uni-flow custom tank. Any ideas? One last thing about tanks: use annealed copper tubing vents, as those will not be affected by motor vibration fatigue.

Cut out the plywood firewall and rear bulkhead from 1/8" stock. Wedge the masterpiece tank between them, and epoxy the fuselage sides to the tank assembly. Tack-glue the sides at the tail—watch the alignment carefully, and let dry.

Drill the motor mounts for your engine, epoxy in blind mounting nuts and temporarily mount your engine. Treat the mounting bolts with paraffin before tightening down your engine bolts. Be certain to plug the intake and exhaust port areas to protect against balsa dust. This also goes for the tank vents. Now tack-glue the top and bottom nose blocks in place, glue on the plywood nose ring, mount your spinner (an old one), and start shaping the blocks. *Fun!* Your wife will love the shavings you leave throughout the house. Look at that telltale trail from the model den to the refrig!

After you have shaped the fuselage blocks to your liking, pop them off and hollow. Keep hacking, until you can barely see light shine through the blocks when held up to a strong light, or perforate balsa with a pin to check the depth of the

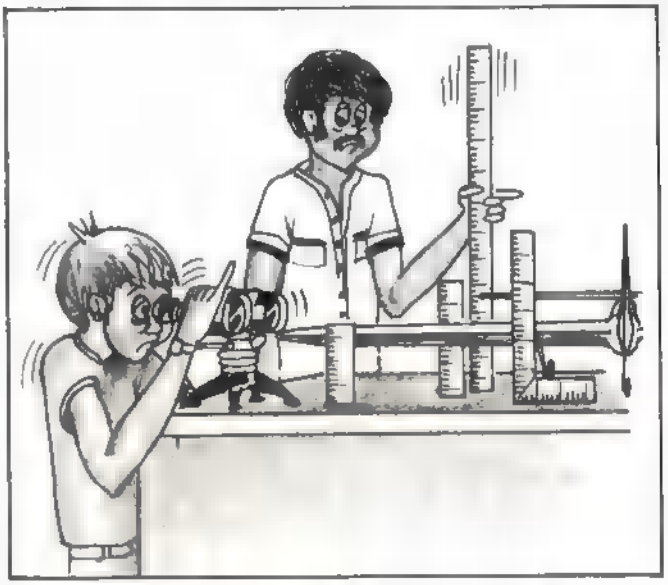
A strong light, a pin for perforating, two good methods for checking the wall thickness of hollowed nose blocks. Use the light to blind yourself, then run the pin through a finger.



block. How much you hollow depends on the hardness of your determination and the softness of your blocks. (Heavy deal?) I hope not! I prefer hollowing to about 1/8" wall thickness.

Now the fuselage can be joined to the wing. (Hey, its beginning to look like an airplane!) Tack-glue the top forward block, so that the fuselage will remain fairly rigid while you tackle the job at hand. Mix up a small batch of five-minute epoxy and carefully tack-glue the body to the wing, making sure of proper alignment. Zero error alignment is a must to assure a contest winner, as cockeyed stunters never seem to win the goodies. Remove the top block and, using thin strips of fiberglass cloth, epoxy the interior joint for maximum wing strength. Make a good bond in these areas to prevent any stress cracks from forming. Coat the forward passage way for the cooling air with epoxy, as well as the engine compartment, to insure a minimum of fuel soakage.

Let's now attack the installation of the ventral fin. This is built of two 1/8" quarter grain pieces, glued up as a unit. Inlay a piece of 1/8" dowel on the bottom. This should help relieve a little hanger rash in this highly vulnerable area. The top rear block of the fuselage can now be installed, and



Be extra-critical when aligning the flying surfaces. Use five-minute epoxy to permit plenty of adjustment time.

notched to accept the dorsal fin. This is built up also of two 1/8" quarter grain pieces, glued up as a unit. Check for alignment and glue permanently. Locate the area where the pushrod will enter the dorsal fin and cut an opening of adequate size. Now carefully position, align and center the stab on the dorsal fin; then tack-glue and pin it in permanent position. Remember to splice the pushrod before gluing on the stab, because minor corrections for any misalignment of the pushrod length can be made by sliding the stab back and forth slightly before tack-gluing.

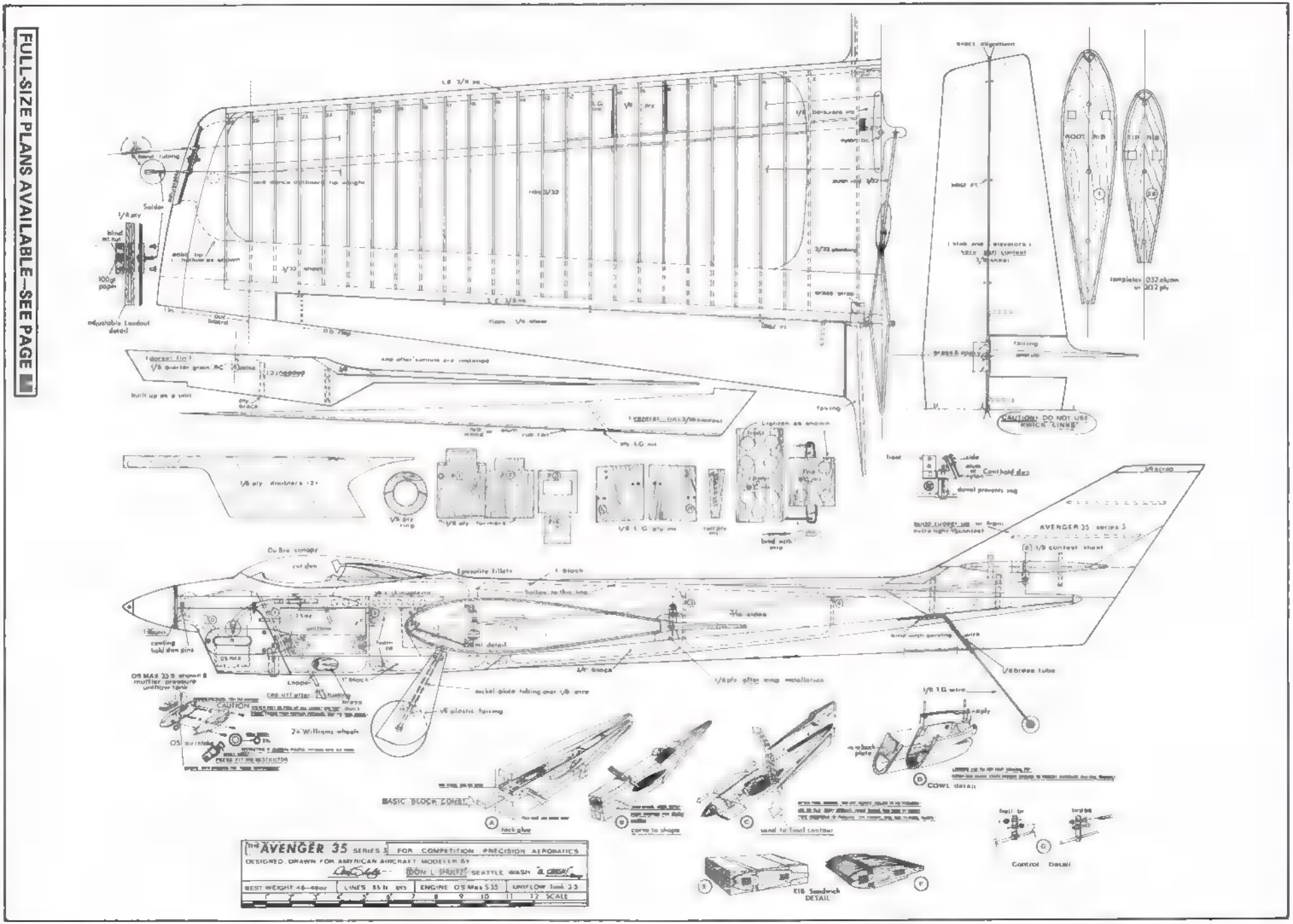
The rudder is now glued up as a hollow structure and located on the top of the stab. I use no rudder off-set; however, I do airfoil my rudder carefully. Two degrees of engine offset is emplyed and, with this arrangement, I've found line tension never to be a probelm. Careful use of adjustable lead-out location and tip weight control should also be used.

Add the cockpit detail and prepare the canopy. I've used a size 4 Du-Bro canopy, cut down and squeezed together over an electric stove burner. Clean out that cockpit very carefully and seal it completely. Nothing looks worse than vibrating balsa shavings in the cockpit of a newly finished stunter. Make certain your pilot, if you use one, is permanently nailed down, because once we close the canopy. . . that's it! Remember, anything that breaks off inside that canopy can cause extensive damage through vibration, and can completely riddle the soft plastic canopy. Glue the canopy and hold down with masking tape until dry.

Outline and mask off the entire canopy works with a double layer of masking tape. Caution! There are no "deals" or bargains on masking tape. Buy a good brand, and seal the

(Continued on page 92)

FULL-SIZE PLANS AVAILABLE—SEE PAGE



The AAM Glowdriver

Here's a gadget that takes the sense of accomplishment out of starting your engine.
by C. W. McCutchen

Starting a model engine is a test of skill. The biggest problem is drowning the glow plug with fuel. A flooded plug gives no ignition. Afraid of the resulting silence, one tends to underprime, and get silence anyway. The AAM Glowdriver clears a drowned plug in a fraction of a second. With ignition guaranteed, a big shot of fuel may be applied through the exhaust port—no more fear of overpriming. All engines tested so far have started with a few flips of the propeller—even in freezing weather.

The AAM Glowdriver ends the minor worries, too. It will heat the plug all day long (a month or more of steady flying) on a single charge of its 12 volt motorcycle battery. It tells if the glow plug is burned out, and it warns, hours in advance, that the battery is weakening. There is no battery drain when the unit is not connected to the plug. Except in one important way (see below), the Glowdriver is used just like a clever battery.

It heats the glow plug with current pulses of variable length (about 13 milliseconds apart). During each pulse, the potential across the plug and leads is about eight volts. The current through the plug is ten amperes, more or less, depending on the resistance of the plug. As the Glowdriver heats the plug, it simultaneously measures its temperature. It then automatically adjusts the length of the current pulses, to bring the temperature to the right value for guaranteed ignition.

When the plug is fuel-soaked, the current pulses are up to six milliseconds long. The fuel near the hot element boils so violently that the excess fuel is immediately expelled. As the plug warms up to its normal temperature, the length of the current pulses drops to about .2-.5 milliseconds, depending on the type of plug.

The heating current is switched on and off by the power transistors X5 and X6, under control of their driver (X4). This, and the string of emitter followers, X1, X2 and X3, form half of a multivibrator, which times the current pulses. The other half of the multivibrator is X7.

The resistance of the glow plug rises as its temperature increases. To measure its temperature, measure the resistance with a Wheatstone bridge (the circuit to the left of X8 and X10 in the drawing). Bridge unbalance changes the potential between the base and the emitter of X8. If the glow plug is too hot, the current through X8 is larger than it ought to be. This current is amplified by X9. The amplified current speeds the discharge of the .47 microfarad C2. In this state, X7 is cut off, which shortens each pulse of heating current, and returns the glow plug to the right temperature. The temperature is set by the 500 ohm potentiometer.

If the glow plug is too cold, X9 feeds less current to the capacitor C2, and the pulses are longer. When the plug is extremely cold, X9 is cut off, and the capacitor is discharged only by current through the 15 kilohm resistor. This gives the maximum pulse length, six milliseconds.

The current to run all parts of the circuit comes through the glow plug, and stops entirely when the plug is disconnected. Except during the heating current pulses, the circuit draws less than 50 milliamperes, which causes negligible potential drop across the plug. During the pulses of heating current, when the potential drop across the plug and leads is eight volts, the diodes D1 and D2 (above the bridge) cut off. The circuit then coasts on the charge stored

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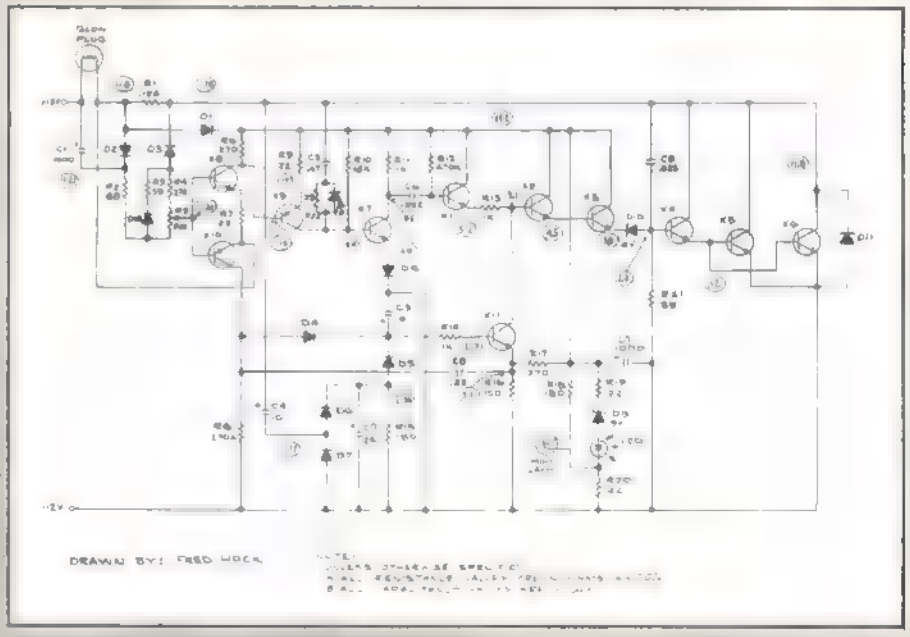
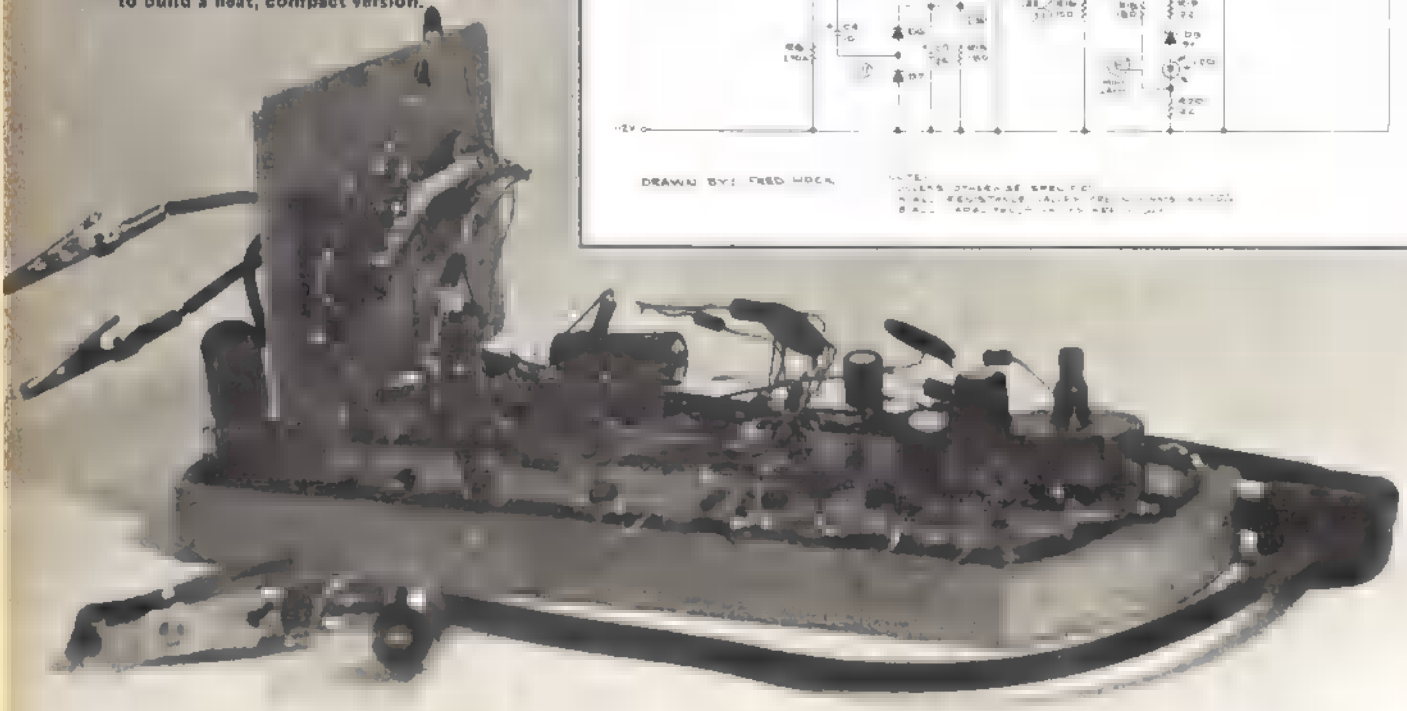


The prototype AAM Glowdriver. When the author said that he had one roughed out on a breadboard, he wasn't kidding—it's an honest-to-goodness board for cutting bread! The accompanying article by Hobie Steele tells how to build a neat, compact version.



The Fast Start Set Uses The AAM Glowdriver

Here's how to build an AAM Glowdriver, using a printed circuit board. / by Hobie Steele

Late last fall, I was the last guy left at the field. There was plenty of daylight left, and I wanted to do more flying. I cranked away, with nary a pop from my engine. I finally decided to check the glow plug. It was lukewarm, but not hot enough to fire off my engine. Other plugs produced the same (non) results, and not a buddy was in sight from whom to borrow a fresh battery. Has it happened to you?

Chin up Ducky, here comes the AAM Glowdriver. It's a new and better way to light that glow plug from your 12 volt starter battery. With flooded or dry plug, upright or inverted engine, in hot or cold weather, with fully charged battery, or almost flat, you'll go every time. The AAM Glowdriver is a solid state, pulse width modulated power supply, which senses a given glow plug's needs and keeps it cherry red. Let me tell you how my Glowdriver came about, and show how easily and inexpensively you can duplicate it for yourself.

I was becoming a year 'round flier. As winter approached at my Maryland flying grounds, it appeared to be about time to make the transition from prop-flipping to a 12 volt starter. I bought a starter and a motorcycle battery. That fateful afternoon, I realized that a dry battery was not going to be satisfactory for heating glow plugs in cold weather.

A carbon-zinc battery's voltage drops significantly with lower temperatures. Nickel-cadmium cells begin at .3 volts lower than most glow plugs like. A dropping resistor could be used from one (2 volt) cell of the 12 volt motorcycle battery, but lead-acid cells vary significantly in voltage from fully charged to partially discharged. The voltage drops even more under the load of a starter, with the glow plug voltage following suit. Besides, a dropping resistor wastes the power it absorbs, dissipating it as heat.

Looking for the ultimate circuit, I called Ed Sweeney to find out what new ideas might have crossed his desk. Before I knew it, I was designing a p.c. board layout for McCutchen's schematic of the AAM Glowdriver.

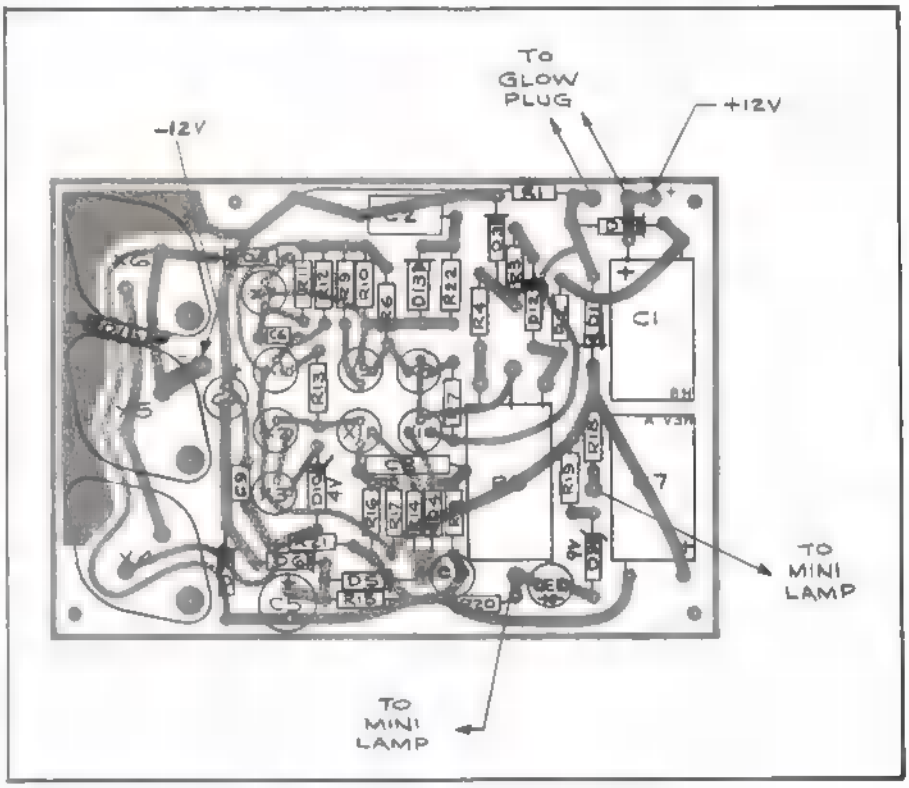
The schematic was one thing, but when I saw a red hot glow plug stay red hot when doused with raw fuel, I was amazed. When it remained cherry red, without burning up, after drying itself out, I knew I had the answer to a starter's prayer.

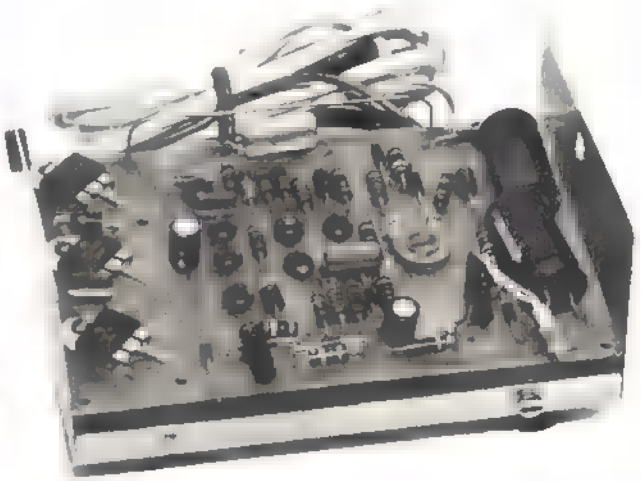
The printed circuit layout is presented here. It can be photographed for photo-etching, or you may use the magazine itself as a negative for exposing photo-sensitive printed circuit material. The board could also be hand painted with resist solution for etching, if desired, using the pattern here as a stencil.

Get all the goodies together and make sure the p.c. board fits the case. Install the components on the board, as shown in Figure 1. Check off each part as you install it, paying careful attention to the polarity of the electrolytic capacitors, diodes, and the LED. Because of the board's layout, transistors cannot be installed incorrectly, so just put their leads in the holes where they fit.

Check all diodes with an ohmmeter as you go, to eliminate the potential

(Continued on page 60)

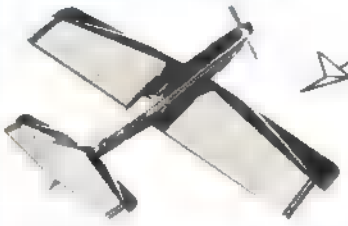




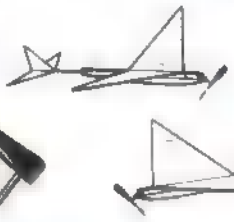
The AAM Glowdriver is ultra-simple to construct, using readily available radio supply store items.

SIG KITS FROM A TO Z

CL-16 Akrobat - $17.95



FF-4 AMA Racer - 49¢

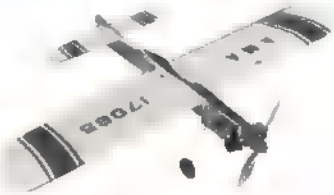


FF-16 ABC Scrambler - $10.50

CL-11 Banshee - $11.95

CL-17

FF-5 AMA Cub - 49¢



RC-25 Aerobipe - $15.95

CL-20 Akromaster - $5.95

CL-6 Bearcat-$9.95

CL-12 Buster - $5

FF-14 Flip - 89¢

CL-5 Fokker D-7 - $8.95

RC-29 Komet Balsa Skin - $42.95
RC-29 Komet Ply Skin - $46.95

RC-32 Komander -

FF-9 Fairchild 24 - $5.95

CL-8 Focke Wulf 190 - $9.95

RC-31 Sig Kadet - $25.95

RC-33 Libe

RC-27 Ryan STA - $59.95

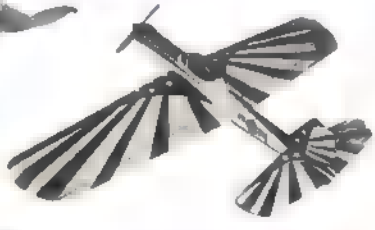
FF-6 Ramrod 250 - $6.50

KBC

CL-19 CL Super Chipmunk - $17.95

CL-4 Spad 7-$8.95

CL-13 Shoestring - $5.95



FF-17 Stinson L-5

CL-1 Super Spitfire - $9.95

FF-19 Schweizer I-30 - $5.95

FF-8 Super Cru

FF-3 Sinbad 40 - $3.95

KBRC-1 Super Chipmunk - $39.95

FF-2 Super Sinbad - $7.95

SIG MANUFA

SIG

MONTEZU

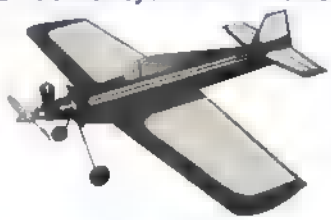
- FOR C/L, F/F AND R/C

.7 Beechcraft Staggerwing - $4.50

RC-30 Citabria - $34.95

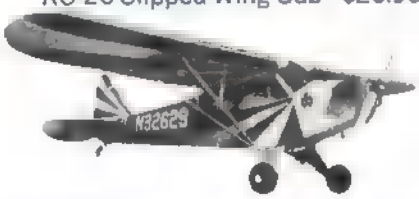
FF-11 Cessna L19 - $5.95

CL-15 Deweybird Mk 1 - $4.50



$5.95

RC-26 Clipped Wing Cub - $26.95



FF-20 Cabinaire - $2.25

RC-14 Doubler - $14.95

- $2.50

RC-28 Mustang 450 - $32.95

FF-1 Sig Cub - $1.49

FF-13 Pigeon - 79¢

CL-9 North American AT-6 - $9.95

FF-15 Parasol - 98¢

berry Sport - $43.95

FF-23 Mr. Mulligan - $3.25

RC-3 Piper J-3 71" - $26.95

KBRC-2 Mustang P-51 - $42.50

BCL-1 1/2A Spitfire - $4.95

FF-22 SIG Tiger - $2.25

FF-10 Witch Doctor 800 - $12.95

L-5 - $5.95

KBCL-2 1/2A Warhawk - $4.95

FF-7 Witch Doctor X - $6.50

CL-7 Thunderbolt P-47 - $9.95

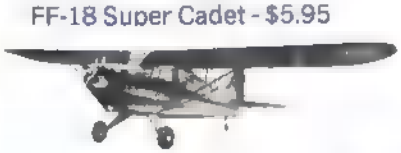
FF-12 Thermal Dart - 98¢

RC-16 Yak 18 - $54.95

CL-2 P-40 Warhawk - $16.95

ruiser - $5.95

FF-18 Super Cadet - $5.95



FF-21 29er - $2.25

RC-23 Zlin Akrobat - $44.95

ACTURING CO.

UMA, IOWA

SIG

FAST START SET

(Continued from page 57)

problems of bad components. For example: on a high quality ohmmeter, the forward resistance of the diodes should be under 50 ohms. In the reverse direction, they will typically be two megohms or greater.

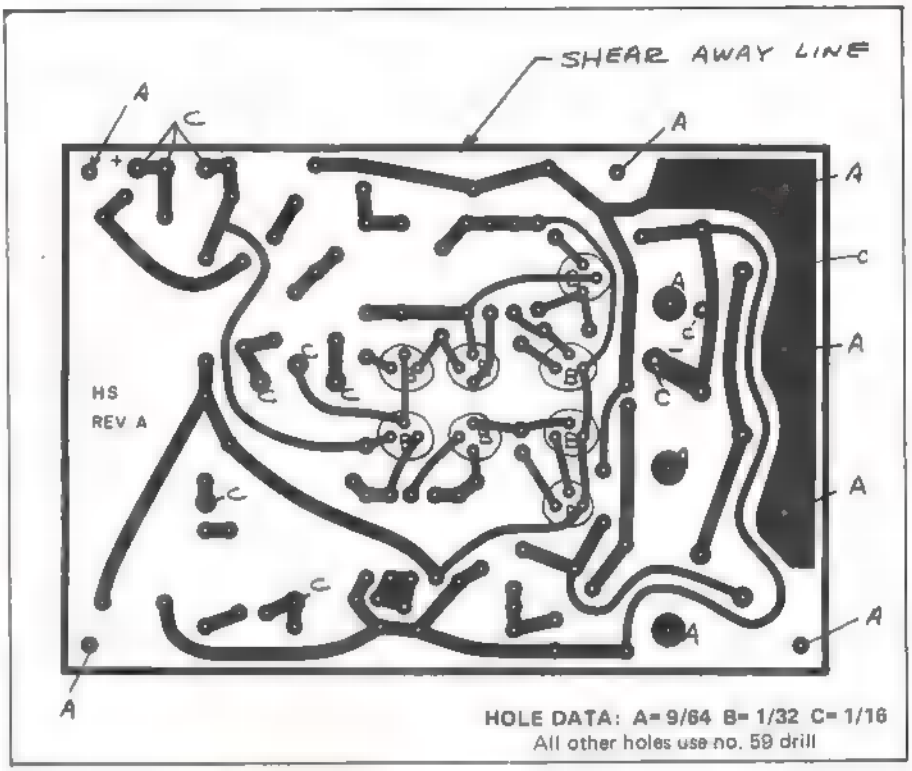
Solder each lead to the p.c., avoiding cold solder joints and solder bridges (solder between adjacent leads). When soldering is complete, clean the copper side of the board with thinner to remove rosin.

The pilot lamp, which lights if the glow plug is on, may be installed in its rubber grommet through the louvers of the Radio Shack case, or in a hole drilled in any non-perforated case you may use. Put a knot in the glow plug and battery leads before fastening them to the proper terminals on the p.c. board, to keep from accidentally pulling the leads out.

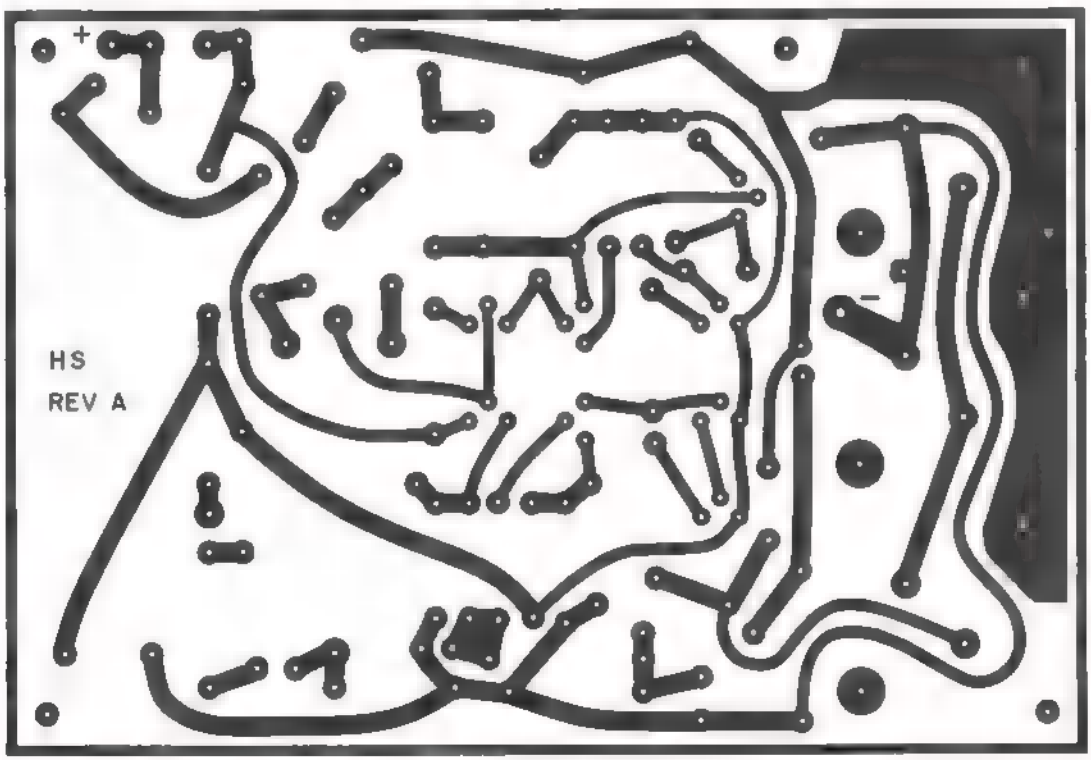
After checking all components to be sure that they are correctly installed, hook up the battery leads to a 12 volt battery, and observe correct polarity (+ and —)!

Turn the potentiometer counterclockwise, to its lowest setting, and short out the glow plug leads. The pilot light should glow, showing that the circuit is on. Next, hook up the GE 1133 light bulb as a "dummy" glow plug. If it glows too brightly, quickly disconnect it and double check the wiring. If problems are evident, but you're sure that all components and wiring are correct, use

(Continued on page 96)



TOP RIGHT: P.c. Drill Guide. Drill holes from foil side, using care and a sharp bit. Use hole data for proper sizes. RIGHT: A handful of components and two Glowdriver printed circuit boards. Two different types of power transistors shown. Using cheaper power transistors could lead to frustration.



FULL-SIZE P C BOARD NEGATIVE

Use this negative on photosensitive p.c. material, or hand paint a board, using this as a stencil. (Circuit layout courtesy Fred Hock)

GLOWDRIVER

(Continued from page 56)

in the two 1000 microfarad capacitors, C1 and C7.

X10 and X11, and their associated components, cut off the current if the plug lead is shortened. They keep the plug from being overheated by multiple illegitimate pulses at the moment the connection is made and broken. The mini-lamp is a pilot light. It goes on whenever current flows through the glow plug lead. The light emitting diode tells the state of charge in the battery. Its brightness falls sharply as the battery discharges, and it goes out when only a couple of hours of operation remain. When both lights are out, either the battery is truly dead, or the glow plug is burned out or badly connected. To identify the trouble, [illegible] can short circuit the glow plug connector. The incandescent bulb will come on if the battery is live. Glowdriver will work without this luxury feature, since a faint buzzing noise tells when it is supplying current.

IN USE

Because different glow plugs have diverse resistances at operating temperature, they may require different temperature settings, even though their operating voltage may be the same. Here the AAM Glowdriver is not like a battery! With an unfamiliar glow plug, start with the temperature control at its coldest (the plug out of the engine). Connect the plug, and raise the temperature control until the plug has the right color. I find that Cox 010, 020 and 049 coiled wire plugs can all be run at the same setting, but may burn out on the setting that runs a Fox Standard plug. The component values in the bridge were chosen to cover all the glow plugs I could find, from the lowest resistance to the highest. To extend its range in the cooler direction, lower the value of R2; in the hotter direction, lower R4.

To start an engine using the Glowdriver, set the needle valve according to the manufacturer's instructions. Prime the engine generously, preferably through the exhaust port, and flip the propeller until it starts. Remember the part about the needle valve. Do not make sure that you have enough fuel in the cylinder by opening the needle valve way up. Neither Glowdriver, nor anything else, can burn a never-ending stream of fuel. Because Glowdriver prevents plug drowning, one may still get occasional firing, and not realize that the mixture is too rich.

If you do not know the right needle valve setting, start with it lean and prime heavily. The mixture must pass through the right value in its progress from too lean to rich. With the AAM Glowdriver keeping the plug dry, the engine will run at least briefly, and you can open the needle valve a bit and try again.

Even inverted engines start easily with the AAM Glowdriver. After flooding my inverted OS Max 10 RC intentionally, I found that it will start in less than fifteen flips. Sometimes, one flip is enough. If you must start your engine in one second, rather than five, you can use an electric starter along with Glowdriver. The OS Max 10 RC and a Webra 60 both roar to life the instant the starter hits the spinner.

Electric starters pull down the battery voltage, and some of them make it very uneven. The glow plug will probably heat up or cool down a bit while the starter is running, but not enough to cause trouble. If the plug gets very hot and threatens to burn out, X7 probably has much less than its proper current gain, and should be replaced.

Glowdriver is great for the hydro modeler. A drowned engine can be running in less than a minute, without removing the glow plug. First, refuel under pressure [illegible] as to flush any water in the tank and fuel line out through the needle valve. When the fuel that drips out of the needle valve is clear, this purging is complete. Prime generously through the carburetor, to dilute the water [illegible] the crankcase. The engine will give isolated explosions almost immediately. After a couple of dozen revs, it will either start, or run for a burst and then stop. In the latter case, priming again through the carburetor will do the trick.

TROUBLESHOOTING

Each of my Glowdrivers has also had at least [illegible] wiring error. All required some troubleshooting before they ran properly. Except for the high power transistors X4, X5 and X6, the [illegible] of hobby grade components has resulted in some defective items.

The wires, shown as bold lines in the drawing, carry the pulses of heating current. Make them no thinner than No. 18 wire, so as not to have unwanted potential differences between one part of the circuit and another. For connecting Glowdriver to the battery and to the glow plug, household lamp cord is satisfactory (not more than 8 feet). If you want to run Glowdriver with 50 foot leads from your car battery, use heavier wire.

Here, an oscilloscope [illegible] a great help. On one Glowdriver, I got rid of the bugs with only a voltmeter, to show that it could be done. The numbers in ovals in Figure 1 are voltages at the various points, relative to the negative buss. Readings are taken with the filament of a Fox Standard glow plug, or [illegible] 1133 light bulb, bright orange. Because troubleshooting can be expensive in glow plugs, I use a number 1133 six volt bulb [illegible] a dummy plug. It draws about the same current.

If the test bulb fails to light, even when the temperature control is wound to maximum heat, put it to your ear and listen. If it is going "ping-ping-ping," the anti-short circuit is firing and keeping the current shut off. This can happen if you start with the temperature control set high. The resistance of the cold bulb is so low, compared to what Glowdriver expects, that it thinks the bulb is a short circuit. Turn the temperature control down to the bottom and bring it back up. If the bulb lights, the multivibrator [illegible] working and all is well. You can confirm this by listening to the bulb. It will be singing continuously from the multivibrator pulses. If, instead, the bulb continues to go "ping-ping-ping," you are on your own. This has never happened to me. If it did, I would check the wiring of the bridge, because X10 must be getting the wrong input.

If the bulb fails to light and makes no [illegible] at all, check that the electricity is actually reaching the timing circuit and the transistors X4, X5, and X6. There should be about twelve volts across each. If the circuit is correctly wired, the pilot light should light. If there are no volts, disconnect Glowdriver from the battery, and use an ohmmeter to locate the break in the circuit. To check the forward conduction of D1, or any other diode, the ohmmeter must be applied the right way round. In both of my ohmmeters the positive terminal *on ohms only* is *black*. To check yours, set it to ohms and charge a large capacitor with it. Then put it on the five to ten volt scale and connect it again to the capacitor. The direction of the kick tells the sign of the charge on the capacitor.

(Continued on page 105)

AAM's Editor gives McCutchen's original AAM Glowdriver (a genuine Joule box) a try on an inverted, cowled engine. It started consistently (about a dozen times) on the first flip.

Where the Action is

L/D=

NEW AIRFOILS FOR SOARING AND FUN FLYING BY ERIC LISTER

Mr. Lister is the author of the Sailplane Design Handbook, *as well as a contributor to* Sailplane, *the Journal of the ECSS. L/D= is a new column, dedicated to exploring* [redacted] *and different approaches to model aerodynamics.*

The purpose of this article is to lay out three brand new, never-before-tried airfoil sections intended for fun flying—free flight, high-wing RC trainers, RC slope soarers. These have valid applications for trainers with wings of up to 12:1 aspect ratio. While these three are all brand new, none of them is a "French curve" design. They all have a strong family tie with the famous Eppler sections and are, in fact, derived from them. They all have 4% max camber and are 10% thick. This article plots the sections and gives their coordinates. It also illustrates some applications, and explains briefly the slight differences that may exist between them and the standard Eppler airfoils.

These airfoil sections are intended for the guy who wants to design a new wing, evolve a new design, and wants the resulting model to be a fun flyer. The information provided can prevent him from being out in left field when it comes to the issue of "will it work?" These new sections are all very nearly flat-bottomed. That pretty much sets the stage for these new airfoils, and should also satisfy a few of the letters I've received for [redacted] flat-bottomed sections. Interested? O.K., let's go do it.

A number of years ago, a practical theoretician, named Dr. Eppler, designed a series of airfoil sections for modelers. These ranged from 5.6% to 10.9% in thickness and varied in camber from 2.3% to 6.5%. In that overall range, there were three sections of moderate camber (2.3% to 5.7%) and thickness (8.3% to 10.9%) that seemed to bracket what I was looking for in terms of good candidates for fun flying. What I was after was a new airfoil of 4% camber, which would [redacted] located at 40% of the chord. I also needed a maximum thickness of 10%, located anywhere between the 30-40% chord location. In the NACA four-digit family, this would have meant an NACA 4410 section.

The actual technique that was used was to break each of the three Eppler sections apart. It was a matter of breaking them into a thickness distribution about an airfoil centerline (mean line), and then proportioning the actual Eppler sections to a 4% max camber and a 10% maximum thickness. Then these coordinates were put back together again to make the new sections.

The three new sections, along with the NACA 4410 are illustrated here. Their coordinates are given below so you can plot them up for your next fun flyer. Each section should be capable of giving reasonably low drag over flight conditions ranging from high speed (slope soaring, or penetration on windy days) to circling or floating about for lift.

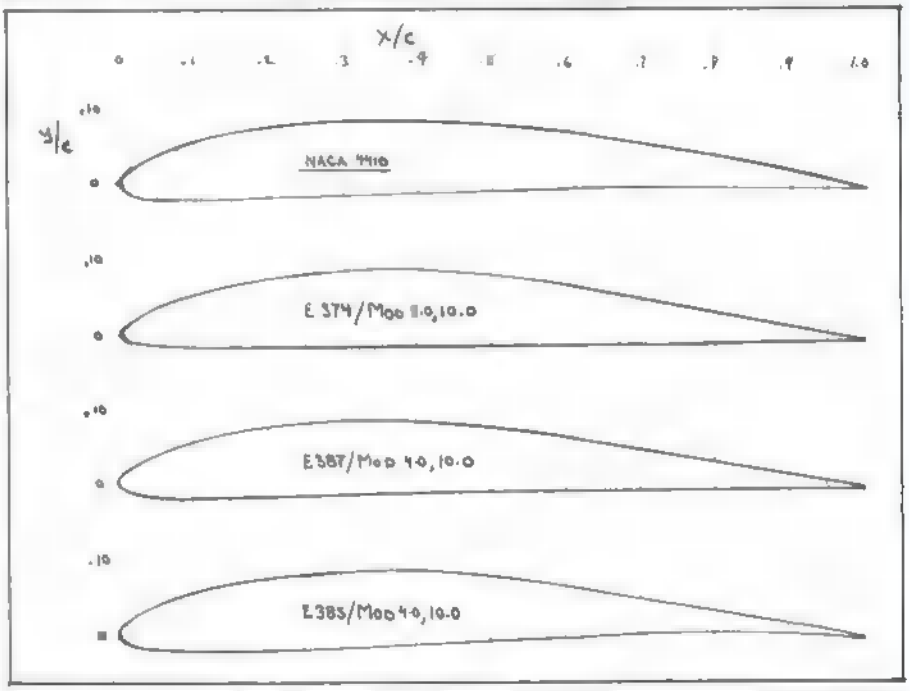
The recommended wing loading for all four sections is about 8 oz./sq. foot, or slightly higher for windy days. For free flight, go for the lightest wing loading you can get, since you've got to chase where the wind blows anyway. The only purpose of high wing loadings (over 8 oz./sq. foot) is to give a high enough airspeed to bring the ship home, without going into a steep dive.

(Continued on page 106)

AIRFOIL COORDINATES

x/c	NACA 4410 y/c		E374/Mod 4, 10 y/c		E387/Mod 4, 10 y/c		E385/Mod 4, 10 y/c	
0	0	0	[redacted]	0	0	0	0	0
1.25	1.8	-1.3	1.4	-.9	1.6	-.9	1.5	-1.1
2.5	2.7	-1.7	2.3	-1.1	2.7	-1.2	2.7	-1.4
5.0	3.9	-2.0	3.7	-1.2	3.9	-1.6	4.0	-1.8
7.5	4.9	-2.1	4.6	-1.4	4.9	-1.7	5.1	-2.0
10.0	5.7	-2.2	5.4	-1.5	5.7	-1.8	5.9	-2.1
15.0	6.9	-2.0	6.6	-1.5	6.8	-1.8	6.9	-2.0
20.0	7.8	-1.8	7.6	-1.4	7.8	-1.6	7.7	-1.8
25.0	8.4	-1.5	8.3	-1.2	8.3	-1.5	8.3	-1.5
30.0	[redacted]	-1.3	8.7	-1.2	8.8	-1.3	8.5	-1.5
40.0	8.8	-.8	9.0	-1.0	8.9	-.9	8.9	-.[redacted]
50.0	8.3	-.5	8.3	-.9	8.1	-.5	8.2	-.3
60.0	7.4	-.3	7.0	-.9	6.7	-.2	7.0	.1
70.0	6.1	-.1	5.3	-1.0	5.4	-.1	5.6	.6
80.0	4.4	[redacted]	3.5	-.7	3.8	-.1	3.9	.8
90.0	2.4	[redacted]	1.8	-.4	2.1	-.1	2.1	.8
95.0	1.3	0	1.2	-.2	.9	.2	.9	.6
100.0	0	0	0	0	0	0	0	0

Note: On all four airfoils, the leading edge radius is 1.10% of the chord length.



BOB STOCKWELL ON RC

Racing in California: The Southern California racing season opened April 6-7 at Whittier Narrows, with 65 entries in Formula 1 (divided 32-33 between Expert and Standard class). A number of developments suggest that it will be an exciting season. In particular, the 1:20 "speed barrier" was broken three times (having been broken previously only once, at the 1974 Tangerines, by Terry Prather with a 1:17). Terry Prather flew 1:17.2, 1:17.8, 1:18.8 at Whittier—in fact, it appeared that he could break 1:20 every time, providing that he could keep his engine running for ten laps.

Terry had two zeroes, because of a hole in his tank that developed late in the contest. The malfunction went undiscovered until too late, but it was quite obvious that, if he can [redacted] consistency to his performance, there is no one who can beat him this [redacted] with his present equipment. He was flying his own version of the "Li'l Toni" Cosmic Wind which is now available in kit form (fiberglass and foam) from Prather Products. It includes an exceptionally clean and simple method of attaching wheel pants that was designed by Lou Tusing, and that is also separately available from Prather Products.

The Prathers are also marketing [redacted] exhaust extension for the Supertigre X-40, a much-needed item if you want to run one of those engines. It cannot legitimately be considered a "tuned pipe," since its sole function is to remove the exhaust from the engine compartment in the most efficient manner. As of this date (early in April) there is still controversy about it, and I do not know what the resolution will be.

It does, in fact, add about 100 rpm to the engine, as compared with no exhaust extension at all, and a right-angle exhaust (i.e., "shortest route out") absolutely kills the engine. To outlaw the extension would be ef-

Kent Nogy (left), winner ■ ■ first 1974 Southern California Formula I race, examines ■ engine installation in Larry Leonard's new LR-1A. Kent and Larry are members of the A&L racing team. All six team members fly identical LR-1As.

fectively to outlaw the X-40, for which the only possible justification would ■ either chauvinism of the "buy American" variety, or simple fear of the competition. I do not think there is any chance that the high quality of competitors we find in Formula I will stoop to that sort of nonsense, ■ I believe that the X-40 is in the ■■■ to stay.

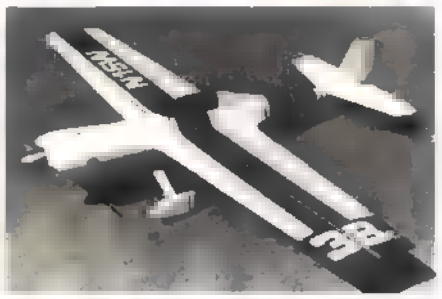
It's by no means a foregone conclusion that the engine will win. There were half-a-dozen others at Whittier, but the top eight positions were held by K&B. And that, as it happens, brings me to another matter.

A few years back, ■■ had a certain type of deliberate frequency choice among top fliers, arranged to guarantee that they wouldn't have to fly each other. Now, virtually all of the regular winners of the last two or three seasons, with the exceptions of Terry Prather and Whit Stockwell, have formed two teams. On 53.3, there will be Larry Leonard, Kent Nogy, Joe Foster, Bud Anders, John Brodbeck, Jr., and Sonny Myers. They are all flying the LR-1A, now available in ■ beautiful kit from A&L Distributors (designed by Joe Foster). It is the cleanest new airplane I have seen; quite similar to the Minnow, but with a nearly straight line from nose to fin along the top of the fuselage. Its profile is very much like that of the Spinks Akromaster.

The other team, ■■ 53.4, consists of Bob Smith, Chuck Smith, Jeff Bertken, Charley Shaw, Danny McCan, and Ron Schorr. They will by flying the PB Products Miss DARA, some with the new extended wing, and others with the standard wing. The teams are, obviously, the A&L Team and the PB Team. Each is demonstrating and, quite naturally, pushing its own product. At the first race, PB had the edge, with four of the top six finishers (Bertken 2nd, Smith 3rd, McCan 5th and Shaw 6th), but A&L had the first position, with Nogy, and fourth with Leonard. None of them, however, beat Prather in ■ race in which his engine ran for ten laps.

Prather has a new ally in the team of Tommy and Lou Tusing, who are flying one of Prather's new Li'l Tonis with an X-40 that is within 100 rpm of Prather's own engine.

Jim Witt with his Thunderchicken. He's back in competition, after a few years of semi-retirement from the racing circuit.



An exceptionally handsome example of the Stafford Ricky Rat.

Tusing nearly lapped Bob Smith in one race, but subsequently had zeroes, caused by failure to stay outside the pylons. And Smith got faster by the simple device of reducing his prop size, raising his standing rpm from 17,000 to 18,200 and his times from 1:29 to 1:21.

It appears to me that we ■■ back to the situation of two or three years ago. First Prather with the G-40 wiped out all the '71 K&B competition. Then ■■ '72 K&B "notorious 100" engines wiped out everybody who went up against them. During the latter part of '73, when nearly everyone had the Schneurle's, it was pretty much a question of who could fly best, because ■■ ■■ had a big engine edge (though some of the custom versions were pretty clearly better than others).

Now, once again, there is ■ least one extraordinary engine (Terry Prather's) with a good four to five second edge over the field. His is not yet (as of April) totally consistent, and no ■■ else seems to have quite his know-how, drive, persistence, and dedication to making the engine perform to its capacity (though Tusing, Jensen, and others are mighty close). The competition between engines will once again be fun to watch. I haven't the slightest doubt that 1:15 will be broken at the Bakersfield race (May 18-19) and, even in the Lake Charles humidity, you'll have ■ ■■ consistently in the low 1:20's to win the NATS.

These extraordinary speeds bring up, once more, the perennial question of slowing them down. ■■ Root, VP for the NMPRA Western (i.e., Northwestern) District, is trying out a new rule in the races in his district this year—the idle rule, as spelled out for 1/4 Midgets. He requires a throttle with no pressurized fuel system, allowing the plane to be landed with the engine running, ■■■ if dead stick. This rule forces other changes: less nitro, smaller venturi, larger props, idle bar plugs, etc. Bob will keep us informed.

His main motivation is quite simple. Because of the high speeds and consequent increased danger, Formula I is dying in his district. It is fading elsewhere, where sport fliers ■■ interested in racing, but afraid to get into an event where the speeds are so great, and where ■■ much obviously depends on engine know-how. ■■ will ■■ much interested in learning the answer to one crucial question: given this rule, is it, in fact, the ■■■ that substantial quantities of ■■■ blood do indeed ■■■■ into the sport?

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JOHN SMITH ON CL

Magnesium Pan Users Please Take Notice: Nick Arpino, maker of those neat magnesium pans, says to take care when doing any work involving the removal of metal from magnesium pans. He had a small fire when his power sander brushes arced. The motor ■■ the sander was destroyed, and the filings from the facing operation caught fire. Also, he had problems when soldering flux (the liquid type) contacted some filings. There was ■ ■■ action between the two and, in ■ flash (no pun intended), it went off. So do all filing out of doors, keep the filings cleaned up and, just in case, keep the fire bottle handy. Your shop area should have one of these handy anyway.

Attention ■■ Jet Fliers: It has come to my attention that, during the pull tests ■■ Jet Speed Ships, when pull testing the engine mount ('74 Rules), some mounts are deforming under the pull. This may, in turn, change the thrust line of your engines. Many mounts, when heated by the engine, loose their temper and become soft (annealed), allowing the engine to twist in the mount during the pull. Check each mounting clamp after each pull, to be sure your engine hasn't changed "direction," allowing the model to become uncontrollable.

This month, we'll start our manufacturers/suppliers lists. What I don't cover this month, I'll finish in the August issue.

Tatone Products, 4719 Mission St., San Francisco, Calif. 94112: speed pans, pen bladders, surgical tubing, test stands.

Dale Kirn, P.O. Box 224, Anaheim, Calif. 92805: complete ½A equipment (from engines to airplanes), parts, stanzel handles.

Progress Mfg., P.O. Box 912, Manhattan, Kan. 66502: Rev-Up props.

Bill's Miniature Engine Repair Service, 1325 Carol Dr., Memphis, Tenn. 38116: H&R Units, US distributor for Rossi engines, Speed Master Pans and handles, lines.

Frannies Chrome Specialty Products, 513 Vesta Pl., Reading, Pa. 19605: Rossi, OPS, fuels, hop up service.

Nick Arpino, 301 Wood Acres Rd., East Patchogue, N.Y.: speed pans, A,B,C.

Tom Upton, 7243 Troy Manor Rd., Dayton, Ohio 45424: engine rework, props.

Mike Hoyt, Hoyts Hobby Park, Newton, Iowa 50208: jet engine equipment, parts, kits, fuels, reworking ■■ Dyna-Jets.

Thomas Products, 503 East Wright, Tacoma, Wash., 98404: jet engine models, long heads and pipes, 'Ironsides' kits.

Bill Keller, 1340 Mint Wood Dr., Centerville, Ohio 45459: racing equipment, F.G. rat race shells, props, lines, carries Kirn Kraft stock.

Aerotique, 19900 Ingersoll Dr., Rocky River, Ohio 44116: hard hats, ear protectors, safety equipment, gift items, fueling goggles, plan service (3/4", 1", 1½" scale Goodyear and Formula V Plans).

Walter Brassell, 4361 Montview Dr., Chattanooga, Tenn. 37411: M-Line handles, custom dollies, torque units.

Luke Roy, 1812 Minnesota, Fairfield, Calif. 94533: Engine rework, specializes in 40s.

Fred Wilson, Rt. 4, Box 473, Charlotte, N.C. 28208: fuel goodies, prop., nitro, alkie, lubes. 1-55 Gal.

Brownies Pro and Sport Hobbies, (Geo. Brown) 122 Bennett St., Port Richmond, Staten Island, N.Y. 10302: speed equipment, engine rework, mini pipes.

George Aldrich, 3219 Shady Springs, San Antonio, Tex. 78230: geared handles, engine work, speed specialty items. GMA engines, VIP engines, (29 and 65s).

Arlie Fridley, 5835 Neoshu, St. Louis, Mo. 63109: limited production items.

Scale Craft Models, 960 Brenner Ave., N.W., Massillon, Ohio 44646: custom-cut speed wings, (tapered two ways), custom-cut speed kits, bass wood.

Randy's, 340 Diana Dr., West Carrollton, Ohio 45449: fuel mixings, custom fuel blending, mixed fuels to 70%, jet fuels.

Nitrotane, Frank Polowy, RR 3, Kewanee, Ill. 61443: fuels mixed to 72%, nitro, lubes, propolene oxide.

Brookstone Co., Brookstone Bldg., Peterborough, N.H. 13458: hard-to-find tools.

If you write to these people, please enclose ■ stamped, self addressed envelope with your requests.

Speed Advisory Committee: The CLCB has OK'ed ■ Speed Advisory Committee to work with them for any rules changes. Members of the group will represent all segments of speed and racing, and will act in an advisory capacity only. Members will be named by the CLCB. This is the first of many steps taken by the CLCB to upgrade the rules making.

Watch Out!: The speed fliers at the NATS this year should have all the room they need, no more 135 foot circles for 140 feet of wire, and much needed ■■■ areas. If you do test fly, Luke Roy says every speed flight is ■ test flight, so make darn sure that your area is cleared of looker-oners and that your equipment is safe. We'll ■■ in ■■ ■■■ where many people have never seen some of you fast guys, so take it easy.

Proposals, Cross Proposals & Ideas: These last few months have brought forth many letters concerning the growing interest in CL safety. Many feel that speeds are getting too high, the pull of some models (mainly Class C) is too much for anyone except ■ muscle-bound athlete. Some want to increase the line dia-

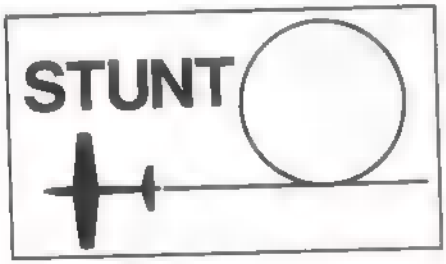
Speed streaker Charles Lieber holds his FAI Speed record breaker. 129.67 mph. (Photo by Lee Lieber)

meter again in order to "slow them down." This was done a few years ago, and we're still going faster than ever.

Having been on the receiving end of many of these letters, and having seen copies of letters sent to other people on this subject, I've formed some opinions and ideas of my own. I'll throw out a few for your reaction. (The idea of a National Speed and Racing Association is catching on, so maybe this column can be used to forward a few ideas from the mail I receive.)

We already have Class A Speed on 60-ft. wire (1974 rules). So there shouldn't be any problem of keeping up with the model from the pylon in this class. Maybe the line size could be dropped a couple of thousandths, which will still give us a large margin of safety. With Class B and Proto, let's put them on 70 ft. of .022" wire (mono-line). We could drop a couple of thousandths off the two-wire line, too. ½A is OK as is. For C, let's put a maximum airplane weight of 36 oz. on them. I have talked to a couple of top C fliers, and they agree that a safe airplane can be built to this weight. To give a quick example of what line pulls can result from weight during flight, try this on for size: a 43-oz. C ship, traveling at 190 mph, will pull about 112 lb. If this same airplane's weight could be reduced to 32 oz. (which would be pretty light for a C ship), it could travel up to 225 mph with a pull of only 96 lb.

(Continued on page 106)



DON LOWE ON RC

Challenge: For you guys looking for new challenges for aerobatic competition or whatever, how about an experiment in propulsion? We all know that engine torque is a problem in performing maneuvers, especially where wide speed and power ranges are required. I have often thought of a torqueless engine or propulsion arrangement—jet engine, twin, contra-rotating props, etc. How about a ducted fan? A lot of experimental work is going on by various individuals. Bob Violett demonstrated a ducted fan model at Toledo this year. Dave Platt is building a twin-ducted fan scale model for competition this year.

I understand that Dave has carved over 50 six-bladed fans in his experimental program! He feels that a very high speed engine is required and is working with racing 40s. He has achieved 6.2 lb. of thrust from a 3-3½" duct! I have heard reports of others achieving over 11 lb. thrust in a 4" duct with a 40.

Now, a ducted fan engine won't eliminate torque, but their small diameters would allow use of two contrarotating engines side by side. Bob Violett reports very little torque effect from his single engine bird. Of course, the ducted fan would open up a new realm of realistic modeling of jet aircraft. Sound interesting?

(Editor's Note: Boy, are we on top of things! See Bob Violett's Sundowner, in this issue.)

Pro-Am Seminar: The Fly Away RC Club, of Northern Virginia, sponsored a Pro-Am Seminar, which proved to be a highly successful, new idea in pattern flying. The concept was to match a professional with an amateur, a golf, but not on a strictly competitive team basis. Instead, George Hill, coordinator of the activity, placed the emphasis on fellowship and learning.

The fellowship end held its own as, throughout Saturday's flying, the evening banquet, and all day Sunday, the Ams got to rub elbows with the fliers whom they hope to beat someday. As the weekend proceeded, the Pros had a chance to rap with their peers about the new FAI Pattern (especially on Sunday, when Jim Martin demonstrated the maneuvers for to critique), as well as to help the fledgling fliers develop those refinements of style that are the key to successful competition.

The Pro-Am Seminar is a refreshing approach to the old problem of communication. It could certainly be adapted to events other than Pattern, and sounds like the perfect tool to stimulate growth and activity in a local club.

Class C for Bipes: As recommended by the National Society of Radio Controlled Aerobatics (NSRCA), a formal proposal will be made to the AMA Contest Board meeting this summer that would have the present Class C Pattern event eliminated and, in its place, a Class C event, consisting of four skill levels of biplane competition. Since the general thinking of the pattern fliers and the NSRCA is to promote the FAI style of flying, Class D, there is no reason for keeping the existing Class C event.

In Spite of Tribulation: I'm sure that all of you have read about the terrible series of tornadoes that ravaged the Midwest in early April. Well, of these killers all but one stroyed Xenia, Ohio—a few miles from my home. Xenia's the home of good friend Jim Cline, who is a helicopter enthusiast (nut?) extraordinaire. This twister displaced affected 25,000 people, destroyed 2500 homes and killed over 30 individuals.

Fortunately, Jim and family were not injured but his terrific garage-workshop was flattened by a tree that Jim says he should have chopped down a long time ago. We helped Jim sort through the debris afterwards, and were amazed to find his two choppers battered, but reparable. Never have I seen a person with more resilience to adversity than Jim—he could hardly wait to get his birds repaired and back in the air. Of course, his workshop will take a lot longer.

Jim has been beset by a series of personal tragedies lately, but his spirit is absolutely unbelievable. Do you suppose that modelers as a whole are like that? After all, what other breed of cat can survive bash after bash of his favorite creations and come back for more? It takes real resiliency to create a beautiful new machine, spend months of painstaking labor, and then see it splattered all over the landscape in one quick flight. Those who stick with the hobby certainly must possess some worthwhile qualities of "true grit," patience, and tolerance to adversity.

But, for those new modelers reading this, believe me it's all worthwhile, when you experience the sensation of personal satisfaction in seeing one's own creation perform beyond your wildest dreams. It's all been worth the painstaking labor, and maybe the anguish of surviving other failures.

This and That: For you guys looking for one of those workbench goodies, Nat Comfort of Chester, Va., has idea. The next time you visit your local dentist, take a look at the plastic box, 4 x 2-1/8 x 2", in which he keeps his novocaine cartridges (ouch!). The box has a grate-like insert. This gadget is free, if he gives it to you when it is empty, and can be used to store drills, screwdrivers, brushes, etc. Just think, now you will look forward to your next visit to the dentist.

Powder puff pattern flier Ramona Shultz wipes down her Kaos after a good flight. The covering job shows why she has won Best MonoKote Finish at Toledo for two years in a row. Rumor has it that she is building a Lowe-designed Phoenix 6. I think I might get beat worse than Bobby Riggs! (Photo by Russ Brown)

Nick DeCarlis, Junior member of the Mohawk Valley RC Modelers, sends this shot of a display put on by his club for Multiple Sclerosis. Modelers are typically involved in such community efforts.

LEW McFARLAND ON CL

Future Stunt Pilots: Without doubt, we need more Junior stunt competitors, as contest entries will indicate. Those kids that hang around asking questions may well fill the bill, if we will but nurture them. Bob Deremer of San Antonio, Texas, is doing exactly that. Bob passed out some scrap wood, some gentle guidance and, before he knew it, he had to give flying lessons. From then on, it was a snowball operation. The point that is being made: don't turn our future stunt pilots away.

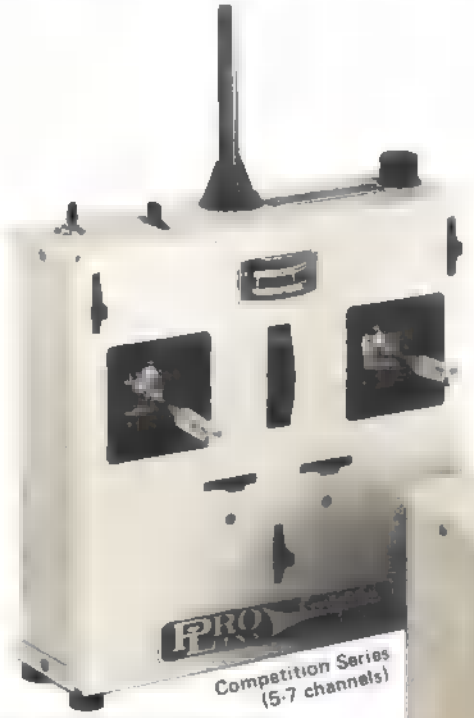
Contest Season: It's time to see who can fly the best with his winter-long creation. Those fliers who get their ships ready early in the season seem to end up in the winner's circle most often.

Considerable interest has been shown by active contest fliers in developing a better means of allowing more people the opportunity to compete in Stunt. I understand that Kent Rogers (5214 Milford Rd., Charlotte, N.C. 28210) is working on a proposal which will encourage more competition engine sizes. At the same time, he is trying to establish a system of classifying competitors.

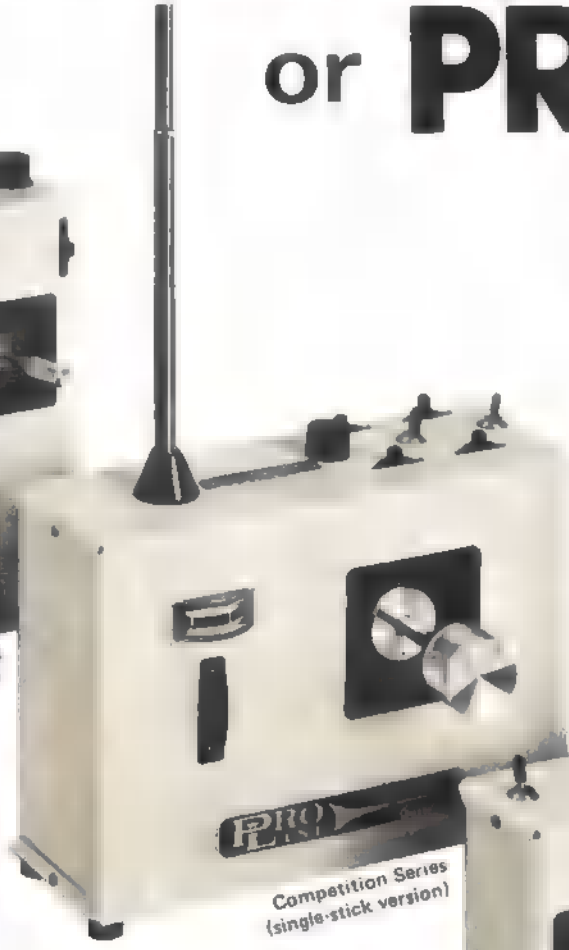
I am inclined to go along with Wynn Paul (*PAMPA Stunt News* Editor) who suggests the following classes of competition: Novice, Beginner, Advanced, and Expert. This is very similar to the classes used by WAM (Western Associated Modelers). The final test will still boil down to what the local clubs and CDs decide to offer. They, in turn, will react to the turnout and show of interest by the contestants in making future plans for contests. We could not expect every classification at every contest, but rather only those classes which meet the needs of the modelers and fit the drawing power of the contest.

As I reflect on some past contests, I think of some rather capable fliers who were in attendance, yet who did not take part. They were realistic enough to know that their entry fee would, at best, be only a donation to the contest, because of the caliber of the other enteries. This is by no means a reflection on these fliers, because everyone has to go

BEGINNER, SPORT FLIER, or PRO...



Competition Series (5-7 channels)



Competition Series (single-stick version)

Challenger Series (5 channel)

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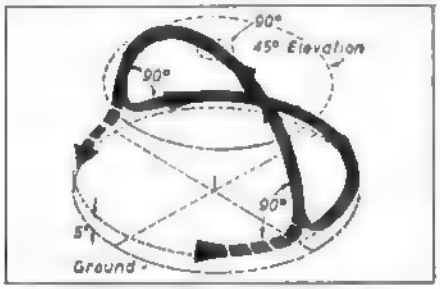
through the learning stage. At present, there is no planned way to allow these people to compete, as there is in radio control.

Correspondence indicates that there is a much larger number of so-called Beginner, Novice and Advanced stunt fliers than the hard-core contest Expert and Masters. In order to upgrade the less proficient and less experienced in competition, there must be local efforts to produce incentives.

Maneuver of the Month: This one creates the greatest challenge for and, without doubt, most competition fliers. Very often, this is where the tempo and perfection of the flight has its real beginning. Not only does it make an impression on the judges, but has a psychological effect on the flier. In either case, it should not be so profound because, in reality, the Reverse Wing Over is just one maneuver. From the AMA rule book:

13.3. REVERSE WING OVERS (One Req'd). Correct reverse wing overs are judged when model starts from normal level flight, makes a vertical climb and dive, passing directly over the flyer's head, cutting the ground circle in half, and recovers in an inverted position at normal flight level. The model continues for half a lap inverted, to the starting point, then makes a vertical climb and dive over the center of the circle from inverted flight and recovers in normal level flight. All turns to and from normal level flight shall be of approx. 5-foot radius.

Maximum 40 points. Minimum 10 points.



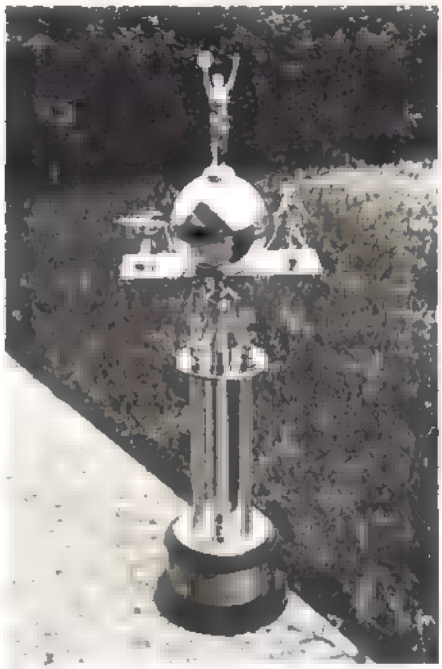
Errors: First Half: Model starts at other than normal level flight, wobbles or mushes going into climb, or turn exceeds 7-foot radius. Model does not cross directly over flyer's head. Model does not circle in a straight line. Model wobbles, mushes, turns a corner exceeding 7-foot radius, or recovers at other than normal flight level in an inverted position. Model does not cut circle in same position and direction in second part of maneuver. Second Half: Scored same as first half, reversing the entry and recovery positions.

It takes little observation to see that both the pilot and the model are presented with varied requirements. If the design is not capable, or the pilot not proficient, I suggest action to correct the situation, rather than repeated faulty Reverse Wing Overs. In other words, break the maneuver down into its components and perfect them one a time, e.g., (1) climb vertical, (2) dive vertical, (3) inside 90° turns (5 to 7' radius), (4) outside 90° turns (5 to 7' radius).

If the plane keeps reasonable line tension overhead, the components can put together easily once confidence and reasonable perfection of each has been achieved. Body position is important, and most of all should be the same each time, to allow consistency and timing. Without studying a variety of fliers, it appears that a fixed position (with the body at 90° to the upwind direction the model passes overhead) and a pivoting action, timed with each recovery into inverted or normal level flight is normal. An exact wind direction determination is important, so that entry into the first vertical climb can be made exactly the model is up wind and perpendicular to its flow. sure to pick a reference point for each turn.

I note, in Dick Mathis' book *How To Fly U-Control*, the statement: "Start directly into the wind." Possibly the connotation intended is: "Start when the wind is directly into your face." The drawing indicates agreement on this point.

I do not disagree with Dick's point: "As the model climbs, take a step back. As it goes overhead, lower hand to take out any line slack. As it goes down, step back the other way." Some variations may be needed to fit the model, the steps should not be taken if there is enough line tension to maintain tracking. In all cases, lead the model through the maneuver, and work at making it flow together from entry to exit. I am open for lessons on this maneuver from anyone.



Thanks to Al Rabe for restoring the original Walker Cup to its pristine beauty. (Photo by Al Rabe)

Mid-America Championships: This annual AAA control line to be held at Kearney Field, Lexington, Ky. Is for July 6th & 7th with yours truly as CD. In addition to the usual events of greatest popularity, claim to second only to the NATS in prestige for Stunt competition, and present a broader offering of divisions in that event. The usual Jr., Sr., and Open divisions topped off with a Masters.

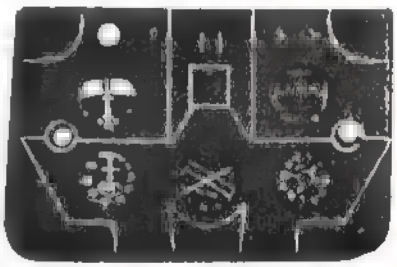
This year, a Novice Event is offered, and even a trophy for the pattern put in by anyone "40 or older." The latter two classifications seem to be growing, although no one wants to admit their qualifications. I have requested PAMPA to take over the Stunt Event, and use it a warm-up to the job of administrating the NATS at Lake Charles. This will allow the group to put into action some of the refined ideas that have evolved, pertaining to operating a fair and efficient AMA Stunt Event. Wynn Paul (PAMPA Sec., Treas., Editor) has "volunteered" to act Event Director. ACTION is promised, there.

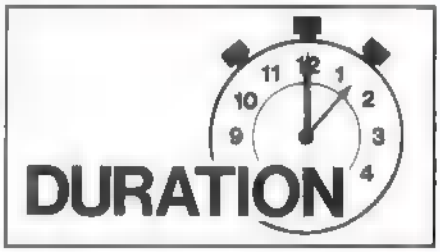
Tim Trimnell's workmanship indicates that he will be a factor in future competition, did real wonders with this Midwest profile King Cobra. (Photo by James Stice)

A converted Top Flite Hurricane, by Cousins. A new stab and twin rudders, as well a new canopy, sure make a difference. (Photo by Bob Cousins)

Instrument Panel: Les McDonald has devised a means of producing a very realistic and yet simple instrument panel for Stunters. Les suggests the following procedure: (1) Cut out .040 white styrene to shape desired. (2) Drill holes for paper printed instruments. (3) Spray lightly with flat black. (4) Glue paper instrument to back of panel. (5) Scribe panel lines; a touch of paint here and there will simulate lights.

The prototype was very impressive (See photo).





CARL MARONEY ON RC

Out of Sight: That's the talk at the annual Toledo Show about the most fantastic sailplane that's ever been manufactured. The soaring world will see literally thousands of these gliders floating in the sky. What is it? It is a Hobie Hawk.

The construction of the wings and fuselage is a revolutionary approach, utilizing automatic equipment and advanced technology in the use of plastics. The inner core of the wings are made of a high-density foam, sheeted with a 1/32" plywood top skin and a 1/64" bottom skin. The wing itself has cut-out rib sections, and is pre-molded to give it elliptical dihedral. The root rib is injection-molded ABS plastic, with the wing leading edge and tips of pine.

The finished fuselage is actually constructed of three pieces. The forward section, called the nose cone, is formed by the rotational molding of cross-linked polyethylene. The mid-section, called the tail cone, is made of six layers of pre-impregnated epoxy fiberglass, pressure-formed under 150 psi at 300°F. The final section, called the tail piece, is injection-molded ABS. The bellcrank, located within the tail piece, is molded of lexan (for fighting excessive wear and stress) and provides for a full-flying stab.

The stabilizer and rudder are constructed similar to the wings, except top and bottom skins are 1/64" plywood. Spanning 99" and weighing in at 30 oz., less radio, the Hawk is

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Atlas Van Lines — Two [illegible] to choose from with this exciting scale hydroplane. The 18" version of this National and Gold Cup Champ can be built for display [illegible] .049 engines. Kit AVL-1
The AVL 36" model Kit AVL-40 [illegible] be raced in RC competition with your .40 engine, wood construction, plastic cowls.

[illegible] Hobie Cat — A cute 14" scale model of the boat that "turned on" catamaran sailing. Built up mahogany hulls . . . no need for dagger boards or weights. A fast sailer . . . a pretty model. [illegible] RS-14

Miss Unlimited — This 36" stand off scale model of typical older Gold Cup hydros has always been a favorite for display, feather or RC running (.29 to .40 engines) mahogany and plywood construction. Kit MU-1

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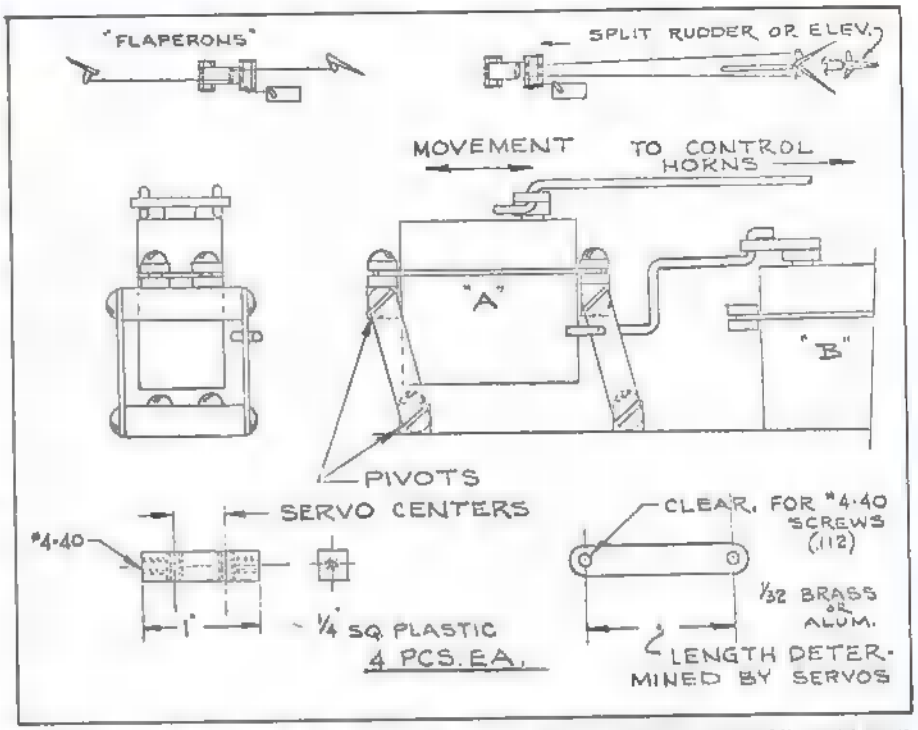
the all-around glider for the modeler or sportsman. The total design incorporates strength where it's needed, yet maintains lightness, for a 9.2 oz. per sq. in. wing loading. The stress to which this glider was subjected (witnessed by this writer) is unbelievable! To complete this kit, Hobie Alter has manufactured a high-strength rigid foam container that is used for shipping and storage, as well as a carrying case.

The Hobie Hawk comes in two forms. The almost ready-to-fly version retails at $89.00; the entirely ready-to-fly version (which is ■ completely finished plane ready for radio installation) sells for $129.00. They are available from the Hobie Model Company, 33081 Calle Perfecto, San Juan Capistrano, Calif. 92675.

Airfoil Sections: A small ■ x 8" book, containing over 300 useful airfoil sections and their coordinates, has been compiled and edited by John Malkin. This publication covers airfoil plotting steps, camber factors and Reynolds' number formulae. Another item of special interest to sailplane builders is data ■■ the Eppler 374, 385, 387, 426, 428, 474 and 475, along with NACA 4309 and 4409 airfoil sections. Copies of this book are available directly from the author: John Malkin, 51 Clyma St., Upper Hutt., New Zealand, at $2.00 per copy. International money orders are suggested, and these can be purchased at your local post office.

Para Pod: A unique launching device has been designed by Tom Williams of Craft-Air. This ■ a power pod suspended under the fuselage. The launching pod can be installed in seconds. Through a very simple release system, the pod jettisons upon engine cutoff (loss of forward thrust) and parachutes back to the ground.

The pod can ■■ used for engine sizes 049-09 and comes completely pre-cut to permit a 15 minute assembly time. Included with the Para Pod Kit, which sells for $6.95, is an assembled synthetic 'chute. If the Para Pod is not available locally, it can be purchased directly from Craft-Air, 5651 Kelvin Ave., Woodland Hills, Calif. 91364.



ARF: From a newsletter of the Fairfield League of Yankee Radio Controllers comes a unique control system for air brakes, rudder-vators or flaperons, developed by Ed Marquis. Previous designs, Ed says, usually have drawbacks such as the servo sliding, thus causing too much friction, and integrated swinging arms and horns which affect the other functions, providing only limited movement. Shown in Figure 1 is ■ design that overcomes these shortcomings. For flaperons: When servo "B" is actuated, servo "A" would move left to right for aileron control only with no effect whatsoever on the flaps. Actuating servo "A" permits the flaps to actuate, allowing you to maintain full control of the ailerons. For split-rudder air brakes: Servo "A" operates the split rudders in unison. Servo "B" would split the rudders in opposite direction for air brakes. O.K., how about split elevators now?

BOB MEUSER ON FF

Prop Pitch: There are many methods for laying out a prop blank for a specified pitch. There are also many methods for determining the pitch of a prop that already exists. How■■r, the methods devised by James Jones Jr., of Mt. Clemens, Mich., must be the simplest yet devised by the mind of man. No math is involved, and only the simplest tools—a square and ■ ruler—are required.

Both methods are based on determining the location where the blade angle is exactly 45°. The table gives the pitch corresponding to various values of a thing called R. R ■ simply the radius (the distance from the prop-shaft) to the location where the blade angle is 45°. Here is how to determine the pitch of a prop that already exists. (Refer to Figure 1.)

Lay the prop (face up) on a table, with one blade tip extending beyond the edge of the table, and the bottom surface of the blade in contact with the edge of the table. Using ■ square, find the location where the opposite blade makes ■ right angle with the table. Measure the approximate distances from the edge of the table to the center of the prop, and from the center to the square.

Juggle the positions of the prop and the square until those distances are equal. If you cannot do that in 8.3 seconds, you lose—go back to Square One. Pinpoint accuracy is not required. Measure the distance from the edge of the table to the square. Divide that number by two; the result is R (I said that no math was required, but if you are unwilling to divide a number by two, forget it.) Go down the column labeled R in the table, find the number that is closest to the R you just measured, and read the corresponding pitch.

Here is how Jones' method is applied to laying out a prop blank. We illustrate the application of the method to ■ simple ■ block, sometimes called an "indoor" ■■ "Bilgri" blank (although Joe Bilgri disclaims credit for it). The ■ block is rather wasteful of balsa, but it is simple. Jones' method may be applied to other types of prop blanks, but the purpose here is to illustrate the method, not to compare various methods of laying out prop blanks. (See "How To Carve Propellers," Jr. American Modeler, July-August 1973.)

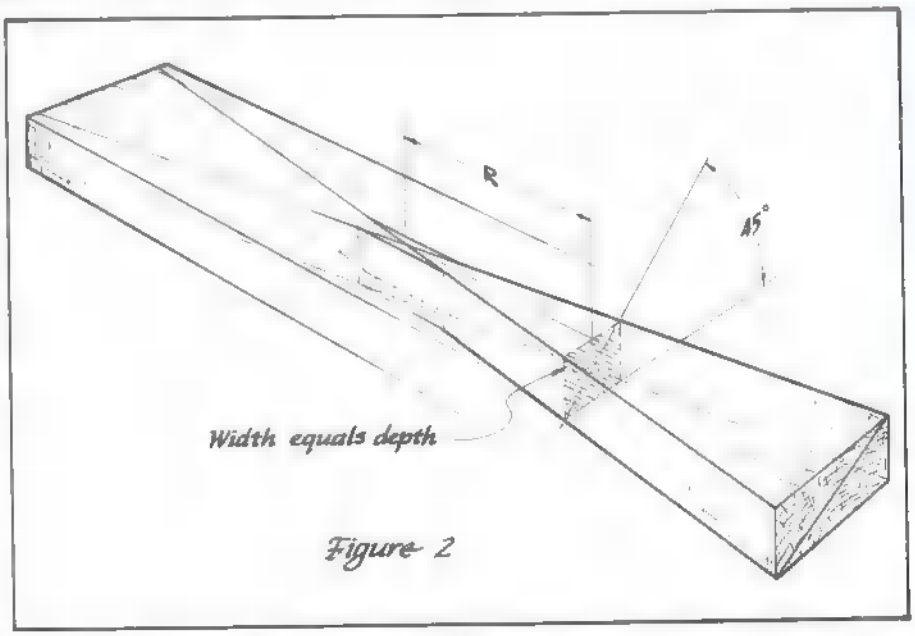


Figure 2

Let's illustrate the method by ■■ example. (Refer to Figure 2.) Let's say we want to carve ■ prop with ■ diameter of 20", and ■ pitch of 24". Select ■ piece of balsa, say, 1" thick, 20" long, and about 3" wide. Find the center of the face of the block. For a pitch of 24", find the corresponding value of R from the table—3.82". Draw lines across the face of the block at ■ distance R (3.82") from the center. Along those lines, lay off distances equal to the thickness of the block (1"), centered on the width of the block. Draw the diagonals, ■■ illustrated. That is all there is to the layout. Now carve the prop in the conventional manner.

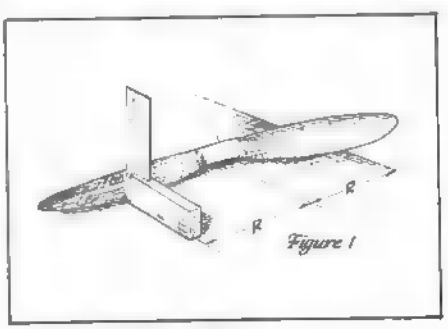


Figure 1

If the diagonals run off the sides of the block before they reach the ends, a wider block must be used. If the blades seem too narrow, a block that is both thicker and wider must be used. However, with the application of a little imagination, you can make trial layouts before you purchase the block.

Having wasted my youth laying out prop blanks by slide-rule calculations, I can well appreciate the simplicity of the Jones methods. And, I have a half-carved Wakefield prop, with a pitch of 48", that stands in mute testimony to the fact that even geniuses can make mistakes.

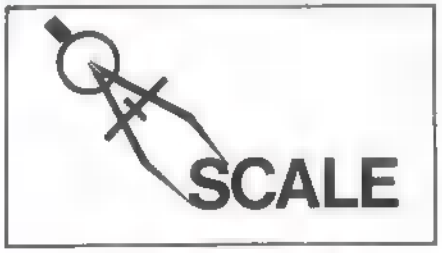
Pitch R	Pitch	Pitch R
5 0.80	16 2.55	27 4.30
6 0.95	17 2.71	28 4.46
7 1.11	18 2.86	29 4.62
8 1.27	19 3.02	30 4.77
9 1.43	20 3.18	31 4.93
10 1.59	21 3.34	32 5.09
11 1.75	22 3.50	33 5.25
12 1.91	23 3.66	34 5.41
13 2.07	24 3.82	35 5.57
14 2.23	25 3.98	36 5.73
15 2.39	26 4.14	37 5.89

Balsa Supplier: Premier Co., P.O. Box 8264, Long Beach, Calif. 90808, carries such unusual sizes as 1/20" square, 1/20 x 3/32" and 1/8", 1/20" sheet, and 5/16" sheet and strip, in addition to the more common sizes. Lengths are 18 or 36", and two hardness ranges are available.

Hints and Tips: Have you ever epoxied a firewall on a fuselage, only to have the epoxy plug the blind tee-nuts used for mounting the engine? The Boeing Hawks newsletter recommends plugging the holes with modeling clay first. After the epoxy sets, poke out the clay with a toothpick. Another solution is to apply soap or grease to a screw, and screw it into the tee-nut (epoxy won't stick to the screw).

We discussed the use of a compass as an aid to finding lost models in the September 1971 **AAM**, page 43. If you wish to learn more about using a compass, you will find many books on the subject. One is *Be Expert With Map and Compass; The Orienteering Handbook* by Bjorn Kjellstrom (Stackpole Books).

And how do you hook up a Tick Off timer to a Pee Wee engine without chopping holes in the tank? Pinch the end of a 1/2" piece of plastic tubing with hot pliers to seal it shut. That serves as a removable plug for one of the vent or fill lines. A piece of surgical tubing runs from the other vent line to the timer. When the timer pinches the line, it robs the tank of air, thus shutting down the engine. It doesn't seem like quite the thing for accurate timing, but it works, according to *Hot Leads*, newsletter of the Southern California Antique Model Plane Society (SCAMPS).

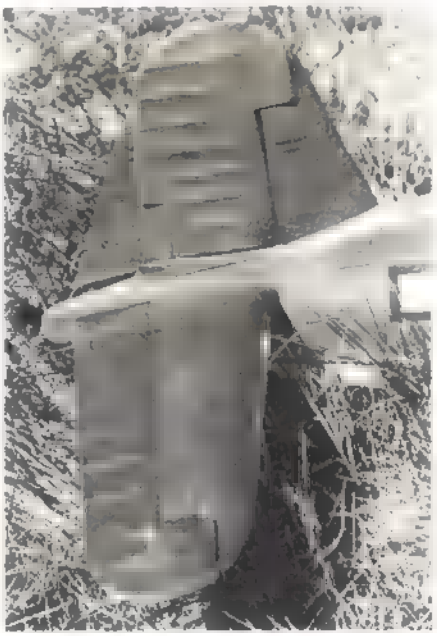


CLAUDE McCULLOUGH ON RC

Spitfire Kit Available: Word has been received from Dave Platt Models that the Spitfire kit is now available again. The period of interrupted deliveries was caused by the change to a new supplier of balsa which, according to Dave, is of "superior quality and grading." As everyone knows, balsa supplies have been difficult for over two years and, to fill the gap, manufacturers often have had to take wood of lesser quality. The signs are that the situation has eased at last, and all kits should now be appearing with top grade balsa.

WWII Scramble: Five fun-packed events are planned for the West New Jersey Flyers WWII Scramble, scheduled for August 17 and 18. Write: Lee Jezorek CD, 1701 Oakwood Terrace, Scotch Plains, N.J.

Super Scale Team: The three RC fliers who were representing the U.S. at the Lakehurst World Championships Meet this month gained



Typical of the detail that will be seen on the models of the U.S. team, Bob Karlsson's Corsair has trim tabs, inspection panels, rivets, seams and fillets.

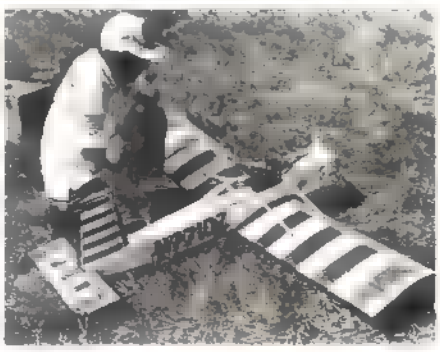
their positions by top placings at the '73 Nationals. Behind those single contest victories lay many years of experience and patient, hard work.

John Roth, a modeler for 32 years, has 20 years background in RC. His pattern designs include the Citation, which was kitted by Jetco. Beginning RC scale in 1969, with a Bucker Jungmeister and a Fairchild 24, his last three models have all been Volksplanes. His achievements have led to a place on the '72 Scale Team to France, and first place honors at the '73 NATS. Deciding to stick with a winning horse, John prepared for Lakehurst by re-covering and adding more detail to his tried and proven model. After 36 years with Grumman, John recently retired and moved to a farm in Virginia. There he is a member of the Central Virginia RC Association, of Lynchburg, and devotes some of his newly found spare time to demonstrating and teaching RC flying to school and Boy Scout groups.

Ralph Jackson was an early victim of the RC bug. He started building in 1946, but did not overcome the gremlins of those pioneer days until 1948, when he finally made some flights. Scale appeared in his workshop in the early '60s, and his B-24 was a popular attraction at the 1963 NATS, where it flew as if it were a sport model, instead of one of the first really successful four-engine efforts. His Piper Commanche placed second at the 1965 Willow Grove NATS, and second again several years later.

An unusual subject, the WWI Handley Page brought fifth place in 1971. The Windecker Eagle kept him on the trophy list with a fifth place in 1972. The second appearance of the Windecker and a beautiful job of flying at Oshkosh, in 1973, put him on the team. The Eagle is being saved as a backup,

John Roth, with his winning Ross-Twin powered Volksplane, will fly at the Lakehurst Scale World Championships, July 1-7.



and another Piper Commanche is being built for the July World Meet. Its features are: 2-1/16" = 1' scale, wingspan of 73¾", Webra 61 powered, Goldberg modified retract gear, and an acrylic lacquer finish. Incidentally, his B-24 and Commanche have appeared as construction articles in **AAM**. He has a Grumman Gulfstream II for Sport Scale under construction, and it will be due for early completion after the Scale Championships.

Bob Karlsson began the hobby in 1941, getting into RC in 1956. At first, his main interest was electronics but, in 1968, he switched to ready-made gear. Instead of spending time looking into a scope, he started building scale models. Among them were such diverse types as the Corbin Baby Ace, F8F Bearcat, Ryan PT-22, Douglas SBD and the Curtiss Junior. His third place F4U at the 1973 NATS was preceded by two other Corsairs. He is refining and re-detailing his Oshkosh entry for use at Lakehurst. During 1973, he flew on the AMA demonstration team, placed first in 12 Scale events, and second in two others. Bob also has a Sport Scale underway that should be an eyecatcher when completed—a seven foot TBD done in pre-war color scheme.

With this sort of background, the interests of U.S. scale modeling are sure to be capably represented at the Aerolympics. It is interesting to note that they are all flying designs with which they had previous experience and flying time and which they had built more than once—something for prospective '76 team members to consider in planning a model for the next trials.

FAN-tastic: Dave Platt recently gave a lecture on scale building at a meeting of the Palm Beach Aeronauts. Climax of the evening was the unveiling of his sensational new AMA scale entry, a nearly completed Messerschmitt ME-262, the World War II twin fighter. Span is in the neighborhood of 80"; length 70". It will be powered by ducted fans. Dave has determined duct dize, fan shape and engine streamlining with a test installation on a Contender. This involved carving about 50 different six-bladed wooden fans—metal proving unsuitable for the job. Since the power requirement called for high rpm, 60 cu. inch displacement engines were dropped from consideration. Most suitable were the pylon racing 40s—for example, the new Supertigre X-40 said to produce 2 hp at 20,000 rpm. With a production engine he has achieved 6½ lb. of thrust with a 3/3½" duct. With further refinement he hopes to reach 8 or 9 lb. of thrust. The model is the usual Platt work of art, with Fowler flaps, scale airfoils and an exact scale internal cockpit structure. Hope he can get it done for the Nationals!

Keep Your Kool: Theoretically, no penalty is attached to having a muffler installed on a scale model, even if it has to be exposed on the outside. But for aesthetic and psychological reasons, it is a lot more pleasing for the builder—not to mention the scale judges (in FAI they can award special ingenuity points for a concealed installation)—to have the device completely out of sight.

(Continued on page 110)

JCM makes a neat 90° elbow for fitting a muffler into confined spaces.

SAILFISH

One of the prettiest sailboats you ever saw [illegible] Die Cut [illegible] strength and [illegible] and [illegible] into [illegible] Hull [illegible] unusual [illegible] with Die Cut [illegible] Mast & Boom [illegible] with [illegible] shown not included

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WALT MOONEY ON FF SCALE

Simplified Scale Contest: A "not-too-scale" contest was run in conjunction with the Ninth Fall Old Timer's contest at Bong field. It was an attempt by the Chicago Aeronauts to have ■ low pressure FF Scale contest, which would appeal more to the sport fliers. It is ■■ event that is especially competitive with kit-built scale models.

Simplified scale judging was used, with only a three-view required for proof of scale. Either rubber or gas power was allowed. Judging was aimed at rewarding overall workmanship, rather than super detailing. Any color scheme was allowed, and there ■■■ ■ special prize for the kit model with the highest contest score. Half of the possible total points were for flight, and the other half for the static scale judging.

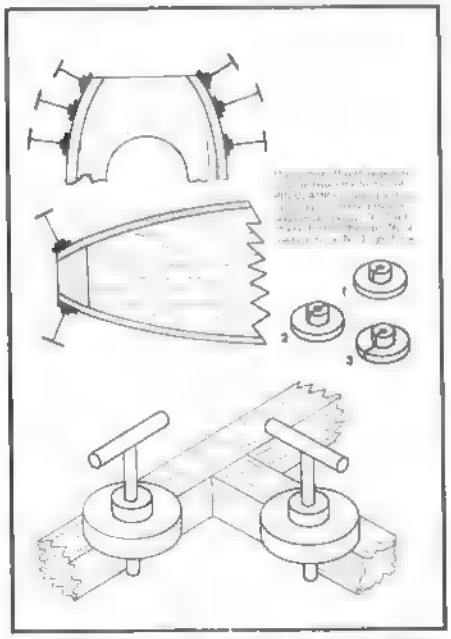
The winner, Phil Cox, flew ■ PeeWee 020-powered SE5, built from a Guillow Kit. The model made beautiful ROG flights. A second SE5 was entered and flown by Chuck Markos, of Deerfield, Ill. Frank Zagar, of Milwaukee, took third with a Guillow Nieuport 28.

Phil Cox prepares his Guillow SE5 for a winning flight ■ the Ninth Fall Old Timer's Contest. Event was a "not-too-scale" affair. (Photo by Dick Stouffer)

Small Means More: Peanut Scale continues to grow. Perhaps one reason is that the cost both in time and money is small. Therefore, a modeler can afford to tackle ■ lot of the more interesting airplanes in the world. One of those who goes in for interesting types is Bill Stroman, who had a really nice DH 5 at the Las Vegas New Year's contest. Other interesting Peanuts seen there were a trio of Laird LC-DC biplanes, and ■ Fokker D-VI and Dr-I.

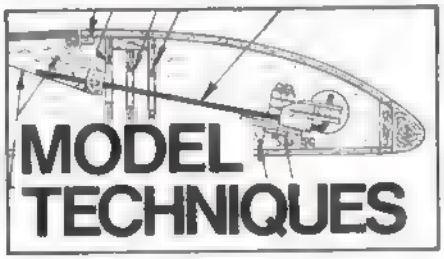
Ukie Goes Indoor: The Red-Max M.A.C. of Bothell, Washington, held their first indoor meet. Although they offered no prizes, except to Juniors, and had little advance publicity, this primarily UC club was surprised to find 40 contestants and 120 spectators at the meet. In Peanut Scale, they had 22 planes entered. As ■ fun event, they flew "Modified Sleek Streek." They allowed any modifications, so long as only the kit wood and the plastic prop were used. Best time was two minutes under the 36 ft. ceiling.

New Pin Clamp: Rocket City R/C Specialties, 103 Wholesale Ave. N.E., Huntsville, Ala. 35811, has come up with a simple little pin clamp that will really be an aid to building. It is essentially a small plastic disk that has a hole in the center of a size that provides a snug fit on a common pin. In use, it permits a large clamping surface, capable of holding balsa sticks in location over the plans, as well as holding sheet balsa covering to the model structure while the cement dries.



Indoor Balsa: A source of balsa, which will particularly please Peanut Scale builders is: Premier Co., P.O. Box 8264, Long Beach, Calif. 90808. Along with cutting all the com-

(Continued on page 110)



MODEL TECHNIQUES

FRED MARKS ON RC

More on the Skywagon: We recently built a Pilot Skywagon. As has passed, and more flights have accumulated, several problems have arisen with it that we feel should be passed on, so that builders can assure greater longevity for plastic models. These problems are:

1. Add a 5/32" music wire spreader for the main gear; the aluminum gear takes a permanent set without it.

2. Beef up the back of the bottom longerons, where the main gear mounts. Use 1/8" plywood, filler blocks, and epoxy.

3. Beef up the nose gear and firewall by epoxying a hardwood block to the bottom longerons and to the back of the firewall.

4. Cut a 1/4" square hole in the lower end of the rudder, just above the control horn, before you install the rudder on the plane. Cut a slot for an added hinge at the lower end. Cut a matching slot in the aft fuselage post for the other half of the hinge. Position the hinge in the slot in the rudder.

5. Mix 1/4 oz. batches of Sig Superfoam, and pour through the hole into the rudder. This will fill and stiffen the lower part of the rudder.

6. Use nylon rod for the pushrods. Set these in place, and retain with silicone rubber sealant.

7. Mount the rudder, with the added hinge, into the fuselage slot.

8. Mix 1/2 oz. of Sig Superfoam and pour it down into the tail, from the cabin. After this batch foams and sets, repeat the 1/2 oz. "shots," until the aft fuselage is filled.

Most of the preceding is needed to stiffen the aft fuselage and rudder setup, to eliminate a violent rudder flutter and aft fuselage stress cracking. We also recommend the use of the steel inner rod, as the rudder pushrod, rather than the normal 1/8" nylon.

Though not a problem on our plane, if one isn't careful, the wing joiner may be installed improperly and the aileron horns can bind. The photo shows it as it should be. Patience, and finger pressure until the adhesive sets, are the key.

Items of Interest From Our Shop: We received a recent inquiry from users of the Digital Commander servo. It seems that attempts to use it with a Heathkit eight-channel receiver were fruitless. The decoder output just disappeared when the servo was plugged in. Our investigation showed that the addition of a ten-thousand ohm resistor from servo signal input to ground (zero volts, black wire) takes care of the problem. A one-eighth watt resistor can be added beneath the servo amplifier board. Future p.c. boards will have provisions for the optional resistor.

We were quite pleased to hear that the 72 MHz version of our Commander receiver successfully passed acceptance test at a local testing firm, Gautnsy and Jones, ACE R/C should be providing kits on the 72 MHz band shortly.

From the Bucks County R/C Newsletter: Pete Wehner tells how to reverse servo travel.

(Continued on page 110)

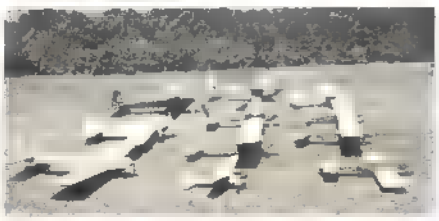
Close up of the proper aileron linkage installation on the Pilot Skywagon.

ELECTRIC FLIGHT

MITCH POLING ON ELECTRIC FLIGHT

Electrics in Hawaii: Captain Henry Pasquet, Hickam AFB, Hawaii, reports that Hawaii is probably the electric flight capital of the U.S.A. Three Astro 25s, two Astro 10s, and five Astro Pup planes are actively flying. His Skylark 56 does inside and outside loops, and can competitively fly Class A pattern. It can do Class B, but not competitively. Henry is uprating the Skylark 56 with an Astro 40 for Class B. A Jr. Falcon and a Jr. Skylark are flying with Astro Pup. The Jr. Skylark is four channel, and capable of all maneuvers, including climbing inverted flight. Flight times for these are in the four to seven minute range. Capt. Pasquet will be doing an article for AAM on his conversions of kits to electric flight, and will be a guest columnist in one of the next columns.

Captain Pasquet's air force. Almost all of the models are electric mods of stock kits. (Photo by Henry Pasquet)



SuperStar Hints: If a prop is broken on the SuperStar, repair it with epoxy and nylon or dacron tape. Be sure to tape both sides of the hub to retain balance. The repaired prop works well, and saves a three week wait for a new one. The was omitted for the RC SuperStar (April AAM). It should balance 1.75" back from the leading edge, if the prototype installation is used. If the Editor's version is used, the batteries for the receiver may be taped to the cone for proper balance.

The connections for the motor batteries may be No. 18 (lamp cord) wire, instead of hookup wire, and only one wire is needed. Noise suppression on the motor is usually not needed; the prototype has worn out two motor units, with no noise suppression and no noise problems. If a tachometer is available, normal rpm for the mahr version is the 3900 to 4200 rpm range.

(Continued on page 111)

Where the Action Is columns are what you readers are doing, making, or flying. Support your columnist with articles, photos, and ideas. Sketch your neat gadget. We'll draft it for presentation. Each item earns you a $5 bill. Submit to the writer, c/o AAM.

HELICOPTERS

JOHN BURKAM ON HELICOPTERS

The Michigan Whirlybirds RC Club by Dave Keats: "At the '73 NATS, helicopter pilots discussed the need to band together and form clubs, and the possibility of a national organization. This prompted me, in August and September, to contact people in my area interested in helicopters and to have an informal meeting. On September 25, a club was formed around 12 people. At present, there are 18 members, and we know of many who want to join but haven't gotten their names on the official roster.

"We have four top ranking fliers (fliers who fly around): Jim West (President of club), Chuck Sherman, Al Stein and myself. The rest are people at various degrees of hovering skills and beginners.

"The single most important fact concerning the club is that not one beginner has ever broken a rotor blade, or, except for two DuBro 505s, flipped over. These 505s have to be excused since, although they are easy to fly, they are the most unforgiving choppers ever! (You hear that, Huber, *easy to fly*.)

"While most RCers hibernate in the winter, when the temperature is in the high 30s or low 40s, there are usually four to six of us out flying on a Sunday. Our most poorly attended meeting had seven members. We usually have 12 or more members at meetings, all of which end up in technical and flying discussions. One item always discussed is parts availability. Of all the imports, only Kavan has made attempts to satisfy customers with parts and technical bulletins. Hegi and Kalt parts are almost non-existent, with virtually no cooperation forthcoming from the distributors.

"Before people deluge me with protests, I have owned none of the above and I am only relating the feelings of Hegi and Kalt owners in the club.

"We in the club feel that there will be a lot more satisfied chopper pilots in our area, rather than a lot of discouraged would-be pilots. We think that this will be due to the amount of help available through the club to

(Continued on page 112)

El Tigre

It's not often that pattern designs break with tradition. When they do, new ideas lead to some startling looks. You can tell this tiger by its tail. / by Dennis Donohue

The idea for El Tigre started to take shape in my mind in the fall of 1970, spurred by the fact that (for the first time in my ten years of RC flying) I finally had a good, reliable proportional set. I now wanted a good competition airplane that would do the pattern better than anything available, and that I could call original.

I decided that I would use tried and proven moments and airfoils, so that I couldn't go too far wrong. El Tigre's airfoil is basically a modified Kirkland (Triton) airfoil, which combines good penetration and speed with the stability advantages of a constant radius leading edge. From here, I departed from common methods and decided to add some of my own aerodynamic ideas, most of which came from the "sounds good" school of engineering.

It is apparent, when looking at our present pattern, that a clean rolling airplane is a must, as almost half of the pattern requires axial movement. So my first set of criteria dictated that I try to get the lateral area evenly distributed above and below the roll axis (longitudinal center of wing). Ideally, this would mean a mid-wing configuration, but I don't care for the look or the hatch problems of this arrangement. I selected a compromise semi-mid-wing configuration.

To this, I added the unusual looking tail, which was a conglomeration of some pet theories. Since an effective rudder is a must with our pattern, and rudder area below the stab is more effective than above, this arrangement now placed half the rudder area below the stab. This setup gives no roll effect when rudder is applied, and makes it very effective for spins, stall turns, etc. I also reasoned that, with equal lateral area above and below the horizontal stabilizer, it would give me a very axial roll, with no tendency to porpoise, as often happens with high vertical fins. As an added bonus I felt that it would tend to eliminate the effect of propwash on the yaw axis during the takeoff run.

My next effort was toward aerodynamic cleanliness and speed, which I felt was an asset to our pattern by decreasing the effect of wind on the flight path of the ship. Therefore, I built the fuselage just wide enough to house all the necessary equipment, with no wasted space. Although it is wide enough to house all presently manufactured equipment, the fuselage is only 2¾" at the

widest point. I then added the scoop type lower nose to facilitate retract gear and tank placement, but I rounded the front of it to reduce drag.

By spring, the Number 1 prototype was ready to fly—and fly it did. Not only did all of my efforts prove out, but it was also the fastest ship that I (or anybody in my area) had ever seen. This took some getting used to because the ship was always a little ahead of me as I discovered when I very skillfully managed to bury it six inches in the ground. At the time, I was in the middle of three rolls when I inadvertantly pulled up elevator at the wrong time. But the prototype had proven all my theories. The roll was very clean and very axial. The rudder was very effective with no roll effect. The takeoffs were straight and true, with virtually no rudder necessary; and, due to its exceptional speed, it didn't even notice the wind.

I can honestly say that I consider this ship to be as good, or better, than any pattern ship now available. In the right hands, it could easily be a world champion. When you build it, you can be sure that you have a winner.

Before you start construction, let me emphasize a couple of points that are very important to achieving a contest caliber ship. First, carefully select very light wood for everything, except the fuselage sides, which use medium sheet. Build light, especially in the tail. I strongly recommend that you build the entire airplane using Hobbypoxy Formula 2, since it gives much better penetration (thus stronger joints) than the five-minute glues. Secondly, go to every extreme to ensure a perfectly aligned and true airplane—don't settle for *almost* perfect. A little more time spent in the shop can save a lot of time and frustration on the field, trying to find out why the ship won't track properly in a certain maneuver. I do not recommend building this ship without retracts, as it seriously impairs its performance. There are also the important aesthetic reasons. Another must is a good, hot 60. The hotter the engine, the better the craft "planes," and the nearer to perfect are the maneuvers. This was proven to me when I took out my hot Webra and installed a prototype of Lou Ross's new 60—this is, in my opinion, the hottest engine on the market. It was like a different airplane; the maneuvers were a lot cleaner and a lot easier to do.

No, he's not Col. William Chenault, but he sure has a flying Tigre.

CONSTRUCTION

Fuselage: The nice feature of construction in the fuselage is the fact that the bottom is a straight line, parallel to the thrust line, so it's a simple matter to draw a line on your building board and let the sheet sides form their own jig. Start by taking the side sheets, and make sure that the bottom edges are straight. Then trace the outline of the wing and stab saddles, as well as the rear angle, and cut these areas out. Do the same with all doublers. Do not cut the nose outline. This assures perfect incidence and thrust line references. At this point, you can adjust the length of the engine compartment to suit your engine and mount. Then accurately trace the bulkhead former positions on both the sides and doublers.

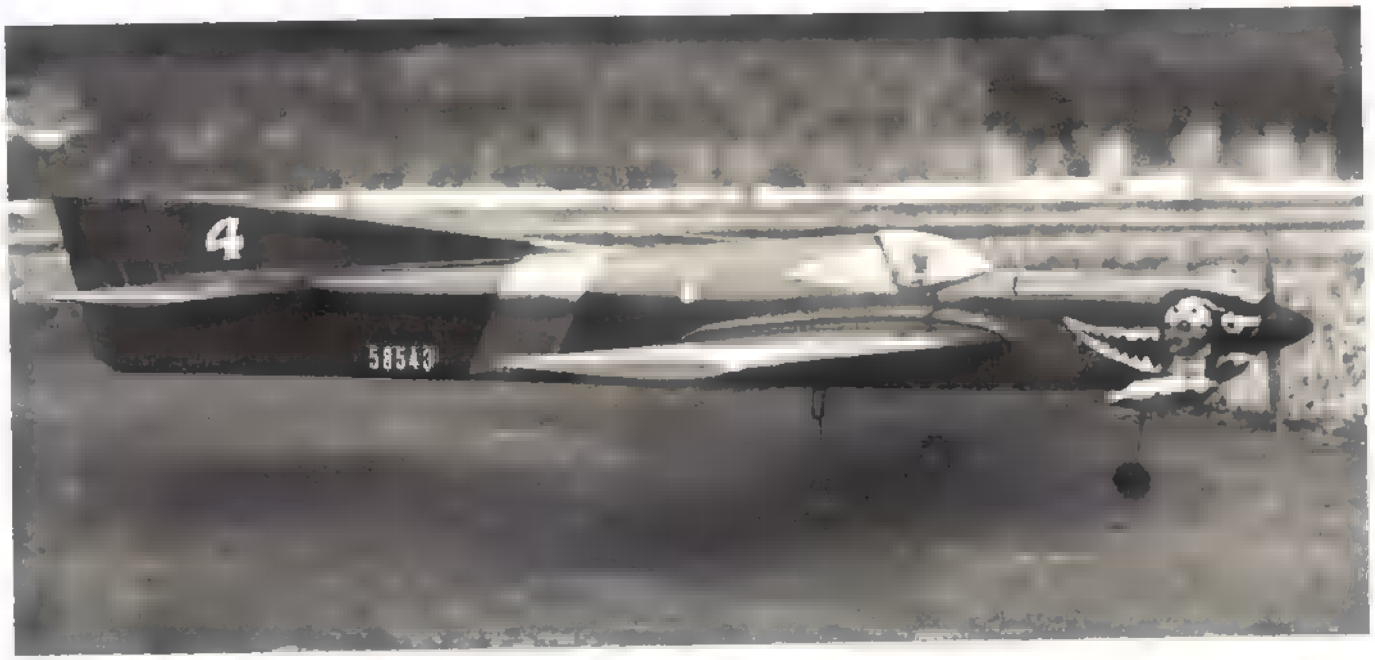
Now contact cement all doublers to the sides (be sure to make a right and a left) and glue on the quarter square longerons, rear triangular stock, and rear stiffeners. While this is drying, cut out all formers, marking the centerline on each one, and drill holes to install blind nuts in firewall for the engine mount and nose gear.

For the next step, Formula 2 epoxy is necessary to give more working time for proper alignment. Draw a straight line on a level spot on your workbench and draw another one perpendicular to it at one end. Now glue all the formers to both sides at the spots previously marked, and place the assembly over the datum line on the workbench. Line up the centerline of the formers with the line on the bench. Line up the front edge of the sides with the perpendicular line. Then clamp the sides to the formers in this position and allow the glue to set. The rest of the fuselage construction is conventional and straightforward. One alternative method of construction for the vertical fin is to laminate it out of 1/8" sheet and two 1/16" sheets to avoid warping.

Wing: You need a very accurately cut set of foam cores. If you skimp here by trying to hack them out yourself without experience, then you might end up with a warped wing, which is useless for precision aerobatics. For one of the most beautiful foam cutting jobs you've seen, you can order a set of El Tigre cores from Control Specialties Co., 110 Egel Avenue, Middlesex, N.J. 08846. This is my source for cores, so I can vouch for their precision.

My method of installing the landing gear, bellcrank plates and wheel wells is to take a sheet of 1/16" aluminum, and cut a template to the exact dimension

No, it's not a takeoff or landing—just a nice slow fly-by with the gear hanging out.



required for each cutout. Mount a 4-40 bolt and nut through the middle (to form a handle) and, holding it with a pair of pliers, heat it over the stove until it is hot enough. You can test it on a piece of scrap foam. Sink it to the desired depth at the previously marked position in the foam. This method is quick and simple, and results in a very clean and accurate hole.

Pushrod holes can be melted by heating the end of a piece of 1/16" wire and dropping it through the core. Install all linkage before sheeting the wing. After the wing halves are joined, be sure to fiberglass the center section. Be careful during the cutting and fitting of the ailerons, in order to keep them perfectly true. The remainder of the wing construction is self-explanatory on the plans.

After finishing the airplane with your favorite finishing technique, mount the equipment, being sure that there is no slop in the linkages. Very carefully trammel and align the ship one last time, being sure it is *absolutely perfect*—don't settle for any less.

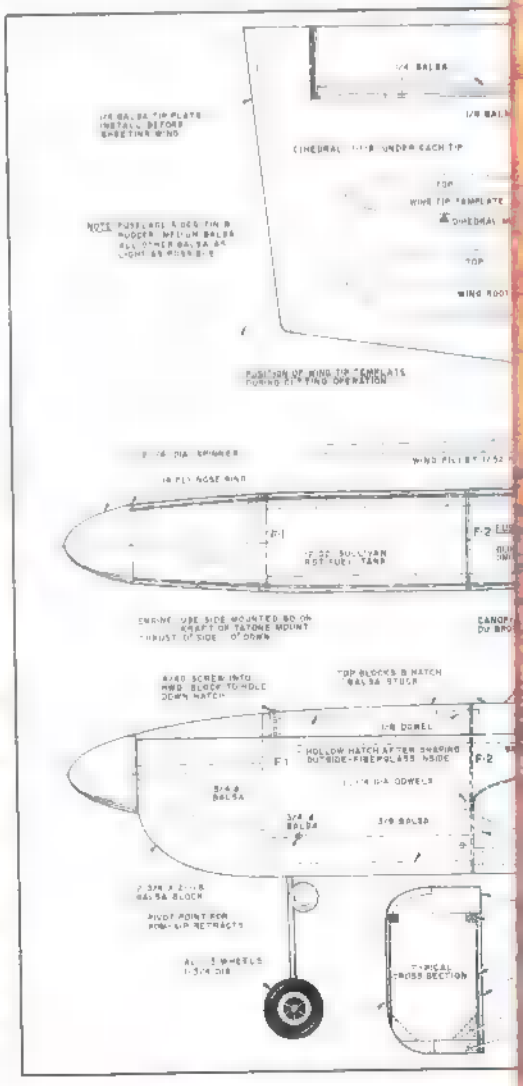
FLYING

If you have done all your homework properly, you should be able to fly right off the deck, with no problems. Due to the fact that this is a very fast and clean ship, you will have to work a little harder at slowing it down for landings. You have to start bleeding off air speed a little further out. However, after a few times, you will be able to slow it to a crawl for some beautiful landings. Now comes the hard work. You should be prepared to spend a month so just trimming the ship. Get it to fly perfectly in every maneuver, so that you will not have to fight the airplane at a contest. Then go out and practice, practice and win, win, win.

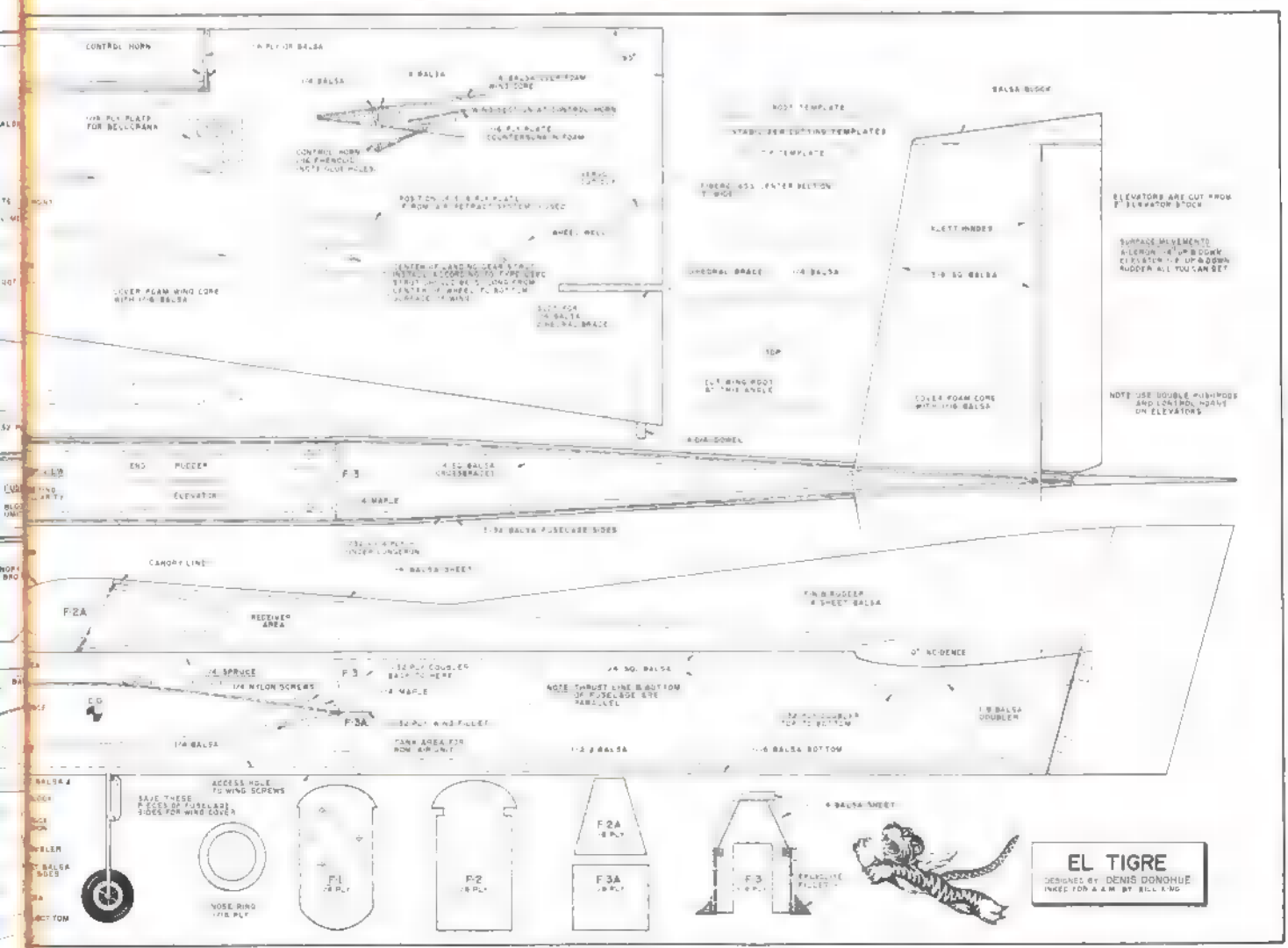
If you decide to build El Tigre, drop me a line and let me know how you make out. Write to Denis Donohue, 35 Arlington Ave., Bergenfield, N.J. 07621. Peace, and may you have true wings.

With a snout like that, who needs Durante! Model was the first to fly the super-powerful Ross engine. Over 100 gallons through the prototype, and it is still pulling strong.

The Tigre's streamline "flaired" look gives it the appearance of really traveling, even when at rest. For those with an eye for totally unobstructed lines, an inverted engine installation would clean things up.



ABOVE: The top planform illustrates some very conventional moment arms and area distributions. The wing design is a descendent of Jim Kirkland's Triton. Nos. 1, 2 and 3: This "walk-around" view of El Tigre gives a good total impact to its unusual features. Fast pattern ships come from clean aerodynamics. With a front profile like this, the air doesn't even know it's been disturbed. Remember the days when cars [redacted] vertical fins on the rear fenders? Wonder if Dennis ever owned a '55 Chrysler?



FULL-SIZE PLANS AVAILABLE - [redacted] PAGE

AAM WEATHERMASTER

(Continued from page 40)

The whole neighborhood just [illegible] to respect any resident who has a Red Baron flying above his domicile. The model is actually very attractive, and tastefully done.

pid. What we ended up with was a DC electric motor, used as a generator, to be read out on a milliampmeter. It's not new. Harrison Morgan proposed such an idea in the November, 1960 *American Modeler*. This was a hand-held anemometer, similar to some of the small commercial units.

I built two different wind vanes. One was a simple plywood profile Mustang, with [illegible] one dollar Aristo-Craft DC electric motor epoxied to its nose, and the plug assembly epoxied into a notch in its belly. Motor terminals were wired to the terminals of the plug assembly. A Wen-Mac 5-4" four-bladed propeller, bushed with brass tubing, was epoxied to the motor shaft, and the whole works epoxied and painted for protection. The prop was put on *backwards* for more efficient operation. Wind moves the prop—quite the opposite of the prop pulling air, [illegible] it would in [illegible] conventional airplane/engine set-up. Wind velocity is read out on a milliampmeter.

The other wind vane was built from [illegible] Monogram/Mattel "Red Baron" kit, which is [illegible] stylized Fokker Triplane. It comes with its own bronze bearing DC motor, which operates nicely as a wind-speed generator. A more durable, higher output motor could be easily adapted if you desire, but the [illegible] which comes with the kit works fine.

If you don't like the "Red Baron," Mattel also offers [illegible] Sopwith Camel, replete with Snoopy himself at the controls. Build them both if you want two weather vanes, but your wife might not take to the idea of an eternal dogfight over the old split-level.

Unfortunately, some of the plastics used for indoor display models do not weather well, and the hot sun may reduce your weather vane to a blob of plastic atop its mast. A friend at [illegible] national testing laboratory exposed a sample of the Mattel plastic for over 100 hours on an ultra-violet weatherometer, which [illegible] the equivalent to many years exposure to sunlight. The result was only a slight fading in color, which would be unnoticeable a short distance away.

Select the kit you want. Then, give your children whatever kit you decide

to use. Have them build it according to the illustrated instructions—then take it away from them!

In working with the different kits, you will find different structures and situations which might require you to make minor changes. I found this in working with the Fokker kit. There are a couple of deviations I made from the Fokker plans. One change was that I epoxied the plastic parts together, for protection against the weather and for durability. Up on the roof, there is little shelter from the elements. The "eyes" in the Fokker cowling need not be plugged, because they do not lead into the fuselage. Cut off the plastic battery box and solder a 10" lead to the electric motor case and another lead to the terminal on the rear of the motor. Bring the leads through a 1/4" hole in the belly of the fuselage, just ahead of the landing gear axle. I added a clear plastic fin forward of the rudder to increase lateral area aft of the pivot, so that it would "point" in the lighest breeze. An X-acto knife, heated with a match, cuts plastic nicely.

Bush a three-bladed plastic prop with brass tubing, and epoxy it to the electric motor's shaft (see Figure 2). I used a four to five inch three-bladed prop, since that's what my local hobby shop had. Use a four-bladed prop if you like—two blades don't work efficiently at very low wind speeds.

Cut a 1/2" diameter hole in the center of the plastic cover from most any aerosol can. The cover should be large enough to clear the 1-1/2" diameter antenna mounting tube and angle brace when the vane rotates. It prevents rain from blowing into the tube. Slip the can lid over the phone plug and epoxy.

Cut a notch in the Fokker landing gear spreader and epoxy the phone plug assembly (with aerosol can lid attached) to both fuselage and spreader—*after* connecting the leads from the electric motor to the wires from the plug. Slip "spaghetti" over the wires before soldering for insulation (heat shrink is best), and tuck the wires up into the fuselage.

Now put the entire weather vane, bracket, and socket assembly together

on the workbench beside your 1-1/2" diameter TV mast. Slip the flat brass coupling halfway down the hole in the dowel. The next step in the operation is for you to measure from the bottom of the angle bracket to the bottom of the servo. Add 1/8", to be sure. Measure this distance down from the top of the galvanized tube, drill a hole, and put any convenient bolt through it. This is to keep the servo from falling through. Drill two holes in the tube for sheet metal screws to the mount angle bracket. Some of these tubes have a large opening at the end and a small one at the other, so several can be telescoped, one into the other—all our construction is concerned with the *larger* end.

Next pick up enough seven-wire *shielded* cable, long enough to reach from the roof unit to the monitor unit in the house. Drill a hole in the tube, large enough for this cable to fit through, about an inch below the bolt. Strip 11" of *outer* insulation from the cable, being careful not to nick the insulation on the inner wires. Remove 10" or so of the shielding, whether foil or braid, and push the wires, cable, etc. into the hole you've drilled for this purpose. Push the cable past your bolt and out through the top of the tubing.

Now remove 6" from five of the seven wires, and fasten wire to each of the five terminals of one of the selsen servos. Write down which color wire goes to each terminal of the servo. Lay the remaining two wires alongside the servo, with the ends exposed. Wrap your servo and the terminals with plastic tape until the servo will fit snugly into the tubing.

Solder the two remaining wires of your seven-wire cable to the terminals of the phone *socket*. Wrap tape around it for insulation, and drop the servo down the tube until it rests on the bolt. Be sure the servo shaft is straight up and down. Now fasten the angle bracket, with the phone socket, to the galvanized tube with two sheet-metal screws. Make a brass clamp to ground the shielding of the cable to the tube under one of the metal screws. Check now to see that the wind vane assembly will fit through the phone socket, and engage it to the slot in the dowel. sure the entire assembly will rotate freely and smoothly. It's heap easier to correct any errors in geometry now, than when you're hanging onto a ladder twenty feet or so in the air, making a spectacle of yourself in front of all the neighbors.

Decorative cardinal points (N,E, S,W) can be attached to the rooftop weather vane if you like. If you decide to make the letters, cut them from hobby plywood and paint them well, for protection. They may be fastened in proper position on the tube with wood or sheet metal brackets, which are epoxied, "U" bolted or metal-screwed to the tube. Use your neighbor's boat compass to determine their proper position.

The simplest arrangement for getting

your weather vane up where it belongs is to mount it on the house like a TV aerial. You may use chimney mounts, which are straps that clamp around your chimney. If your chimney is already occupied by the family TV aerial, then a wall stand-off TV mast mount may be screwed or bolted high [redacted] the side of the house. Either type is designed to hold a section of TV mast, like the one we are using, and is available at the local TV store, or from Allied, Lafayette, Sears, etc.

Fasten the tube (without the plug-in wind vane assembly) to the stand-off TV mast mount or chimney mount, and plastic tape the cable securely to the bracket [redacted] that the wind won't whip it around. Bring the cable down an outside wall of the house. Keep the cable away from any electrical or phone wires.

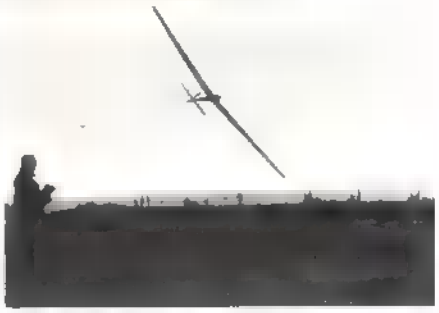
Struggling through the construction detailed above, and finding a place to bring the cable into the house, should keep you busy till next month. Then we'll talk about your remote weather station and calibration of the anemometer and wind direction indicator. If you decide to bring the cable into the house before the next issue, I suggest that you send your wife to the store to buy something, like a dress or [redacted] quart can of prop wash, before drilling [redacted] hole through the wall. Try to miss any wiring in the wall when you drill—that could be messy! If you live north of Florida, there shouldn't be any plumbing in an exterior wall, so just watch out for wires.

Strip the outer insulation from the cable just before it enters the house (at the bottom of a loop provided to allow water to drip off before it runs through the hole in the wall) and clamp the shielded part of the cable to a *good* ground. An outside cold water faucet or a long copper rod driven into the earth should do quite well. This will provide an adequate path to ground, should lightning strike the weather vane. Otherwise, you may find an unscheduled psychedelic light show on the living room wall some stormy night just before the wall disappears. Caulk around the cable where it enters the house.

Next month, the easy stuff. See y'all.

TERN

(Continued from page 20)



With Speed growing in popularity as a soaring event, this bird is a guaranteed winner on the contest trail.

To build the aileron, butt splice the top skin first. Leave extra width at the leading edge, to be trimmed later. Bevel the trailing edge so it will match the underside of the ribs when they are in place.

Mark off the rib spaces and the leading edge spar location so the extra thick rib (18a) is centered on the splice. Install all parts, except the lower skin and the hinges.

Wash-out is built into the aileron as follows. Temporarily install the hinges and mount the aileron on the wing. Hold it in alignment with tape at each

end, and at each hinge location; then attach the lower skin, a half length at ■ time.

The brass tube and spacer, shown in section H-H, should be the first part installed in the fuselage. No special sequence is needed for the remainder of the parts. To locate the main bulkhead, drill a 1/16" dia. hole through each side of the fuselage at the small indentation provided. Align the edge of the bulkhead on the center of the holes. The lower edge of the bulkhead should fit flush with the ends of the mounting rails. After the glue sets, the rectangular blade holes can be enlarged to match the socket in the bulkhead.

When gluing the three pieces of 3/32" tubing in the rudder assembly, as shown in section F-F, use 1/16" brass hinge wire to hold the tubes in line. With this type hinge, the rudder can be easily removed by pulling the hinge pin, thus providing access to the control horns and pushrods.

FLYING

A few hand launches are recommended. It's best to have an assistant do the launching, since it takes a hefty push to get six lb. up to flying speed.

A 12-volt winch should be used. Hold the plane down a little at the start, and don't pulse the winch until the last half of the launch. Control is similar to ■ full-scale plane, responsive at normal speeds with a loss of aileron control just prior to the stall.

Needless to say, ■ large field, with ■ minimum of obstructions, will help take

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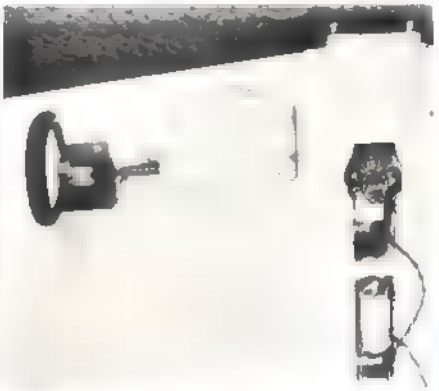
the pressure off for the first landing. A properly trimmed Tern will give you ■ definite edge, whether you're completing, ■ just chasing that elusive thermal.

REAL RETRACTS

(Continued from page 47)



The 180° retract servo installation ■ very practical and trouble-free.

tightened Solarfilm to help hold the door contours. Add the inside door control horns and outside door wire clips, then install the servo. Build the servo arms and pushrods and adjust everything, while checking for smooth operation. Rocket City Missing Links should be used at the door control horns to prevent binding.

I used Solarfilm for finishing in order to minimize weight. Light balsa, thin wheels, small servos, and minimum contact cement and epoxy were used. The result was a retract-equipped FAI racer with a wing weight of 29 oz. (two servos, LG, etc.), and an all-up unballasted total model weight of 4-3/4 lb. This was achieved by very careful building techniques and materials selection.

Try your next racer with retracts—it really makes a difference.

MAGNIFICENT CONS

(Continued from page 15)

with an incredibly fast, boomerang shaped airplane, with a wingspan of five feet. By this time, I had a P-40 Flying Tiger with a spread of 42 inches, and Ollie had a strange looking, but extremely acrobatic, Fokker triplane. All these airplanes were heavy and fast.

For weeks, when the weather was right (and sometimes when it wasn't), we'd been holding acrobatic contests with the smaller airplanes. These naturally developed into dogfights. In true convict fashion, the last plane in the air is the winner. No holds barred, except for deliberately shearing off control lines.

It's a little expensive, maybe, but all good fun. The little airplanes could be repaired easily. But the Black Mountain guys wanted to see the big, fast airplanes fight. A subtle touting campaign was being whispered around:

"Bet Ollie's Fokker would chop up that P-40."

"Big John's Flying Wing would

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0742/AVENGER—CL competition stunter for AMA aerobatic schedule. High aspect ratio wing and stab. Extended ventral fin on extra-thin fuse adds to the model's contemporary sleek looks. A highly refined, contest-caliber design. .35 power, with muffler. **$4.00.**

0743/PHONY FOLKERTS RETRACTS—Plans show complete details for installing fully enclosed retracts on not only FAI racer, but on any model. All details profusely illustrated. Setup requires 180° retract servo. **$2.00.**

0744/PHONY FOLKERTS—FAI Pylon Racer. This speedster resembles its 1937 prototype from only great distance, but its looks are more in line with contemporary styles. Plans include four landing gear configurations, including fully enclosed retracts. Foam wing cores and fiberglass fuselage commercially available. **$5.50.**

0745/TERN—RC Soarer. Twelve-foot wingspan with fiberglass fuselage. Full-span flaperons optimize thermal performance. Coupled ailerons and rudder for tight turning radius. Uses three-function radio, with four servos. Full-size plans (2 sheets) show construction of many useful gadgets. **$9.95.**

0746/SUNDOWNER (F-4B PHANTOM)—Ducted fan stand-off scale and pattern ship. This practical ducted fan design uses the commercially available J.J. Scozzi "Turb-Ax I" unit. Standard balsa fuse and foam wing construction techniques. Anhedral stab and polyhedral wing capture the rakish lines of this popular design. Plane is totally capable of contest calibre maneuvers. Hot rear rotor .40 engine. **$5.50.**

0641/OSKER—RC flying boat. Either built-up or foam 56" span wing. Radio is sealed in unusual waterproof compartment that is integral part of wing/cabin assembly. Fuselage is basic box structure, with tricky keel construction. 35-45 power. Four-function radio, .60-powered version available—see below. **$5.00**

0642/OSKER + 10%—Same features as regular Osker, but for .60 engines. **$5.50**

0643/NOVI ARROW—FAI Pattern ship. Designed by John Brink, twice winner of the South African NATS, and noted internats competitor. Large 70" elliptical winged model emphasizes light wing loading for smooth maneuvers. Large plan sheet highly detailed. For retracts and .60 engine. **$6.00**

0644/SPINKS AKROMASTER—RC Semi-Scale Sport Trainer. Like a Taurus, this model sports large wing for slow, stable flight. A square fuselage, and sheeted built-up (or foam) wing make for quick building. Modeled after a sleek looking full-scale aerobatic design, Akromaster is an excellent choice for introductory aerobatics. Four channels; .60-.71 engine. **$5.00**

0645/BIG BOY IV—1973 FAI Power Free Flight World Championship winner. High-thrust model is a highly refined basic design. Autorudder and V.I.T. Renowned as a top class, consistent model. 64" span; 595 sq. inches. .15 power. Two plan sheets. **$5.00**

0541/FAKIR I—Pattern ship. Winner of AAM's Super Design Contest. Plane has received accolades for its clean lines and striking looks. Well-engineered plan set includes hints on construction installations. .60 engine. Four- to five-function radio. **$6.00.**

0542/MONSTERS MONOPLANES—Successors to Bipes 'N Tripes (Plan No. 0342). The monsters are twin engine biplanes. Plan shows German and British monsters and monoplanes—four different planes altogether. .49-powered CL. Free Tenderfoot decals included. Special Tenderfoot price. **$1.00.**

0543/RUDDER-BUG—RC sport model a revised version of Walt Good's 1954 Berkeley kit design. High-wing trainer or Sunday flyer. Can be flown with anything from single-channel to full-house radios. 61-in. span. .19-.35 engines. **$3.75.**

0441/FLEXI-FLIER—Scale version of an RC rogallo hang glider uses GI Joe doll as a control surface. A highly unusual slope soarer, can also be used on tow. Uses two standard servos. **$1.75**

0442/MISSY DARA—QM with high scale fidelity. Integral wing/fuse construction uses foam cores. Either front motor .15 engine. **$3.00**

0443/THE FLYING OUTHOUSE—CL semi-scale .049 rendition of an EAA project. Not necessarily aerobatic, but an attention-getter that is strictly for fun. Special Tenderfoot Price. **$1.00**

0444/BOOMERANG—Free flight helicopter has dethermalizer-activated trip switch to give forward flight and autorotation. Simple construction employs cardboard engine shroud and full-balsa fuselage. .049 engine. **$4.00**

0341/SUNDAY FIGHTERS—Small, responsive biplane is quick to build with Ace foam cores. Two versions are shown on plans. Ken Willard design. For .10 engines. **$2.50**

0342/BIPES 'N TRIPES—Snappy stunting .049-powered biplanes and triplanes can be built in three styles. Ships are quicky-built and are great for WWI Combat. Tenderfoot plan special. **$1.00**

0343/DAS KRAUT—Crazy, capable stunter incorporates features such moving rudder, shock LG, tip weight, etc. For .40 engines. Nice WWI styling. **$3.50**

0344/TOADSTAR—Huge 150-in. Toad is constructed of foam, ply, Manila folders, anything! Great payload carrier with two .61s. Not full-size plans. **$2.50**

0345/WEDGY—An .020-powered revision of .40s NATS winner. Bold lines highlight proven performance. **$3.00**

0241/NEBULA—Dick Sarpolus' unique RC sailplane can be built with polyhedral or dihedral and optional flap system. All-balsa fuse, sheeted foam core wings. All-moving tail. Plug-in panels. **$5.00.**

0242/PAZMANY PL-1—Scale EAA home-built aircraft model by Nick Ziroli. Features include all-moving stab, balsa construction and .45 size engine. Two detailed plan sheets. **$6.00**

0141/SHRIKE—Fabulous RC Pattern ship designed by pylon champ Bob Violett is very smooth, fast flyer. Design is intended for fiberglass fuse, foam wing, retracts and hot .60. **$4.50.**

0142/FAIRY UNLIMITED—Rubber FF design with lightweight construction for good performance. Features many innovations. **$3.50**

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0931/SPEZIO SPORT TUHOLER—Smooth and responsive CL Scale ship flies like typical non-flapped stunter. For .35 to .40 engines. Two sheets. **$4.50.**

0932/PISCES—RC pattern ship by Dave Hale for AMA-FAI patterns. For side-mounted .60 engine and retracts. Ship has 710 sq. in. area and clean lines. **$4.25.**

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0532/FRANTIQUE I—WWI type plane with open framework fuse, built-up wing. Can be built in three different sizes according to engine—19 to 35. **$5.00.**

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0435/TANGERINE—FOR THE TENDERFOOT a stick and tissue, built-up wing model with easy building and fine flying. Tenderfoot decal included. Special price, **$1.00.**

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0333/CURTISS ROBIN—Rubber scale model for AMA events. Easy flying. Stick and tissue. Square shape builds easily. **$2.00.**

knock 'em both into the next county."

Eventually, the talk got to us. There was a three-way challenge. Me, Big John and Ollie, the founders of the Prop Busters, would compete against each other in the Black Mountain airborne superbowl.

We waited three days for a rainstorm to pass, only to have it linger as permanent drizzle. On a Saturday night in November, the wind stopped and we decided to fly, drizzle or no.

All three airplanes were quite heavy. Each of us had installed an extra gas tank in the wings of our planes, increasing flight time by about five minutes. The light rain would also increase the weight, and each plane carried a tiny penlight in its undercarriage because of the gathering winter darkness.

After dinner, the entire camp assembled on the perimeter of the flying field: officers, forestry foremen, convicts. A replay of our very first flight, when the Stuka wrecked against the long-ago conquered rock wall.

Once again, Lt. Oldham had "business" at camp, but it was finished quickly and he strolled down to the field. "Five bucks on Nivens' Flying Tiger," he grinned to Officer Bauer. But Bauer already had a wager down on Ollie's Fokker, seeming to prefer *deutsche* aircraft.

Ollie's Fokker was started up first, and the 35 was leaned to a whine. My P-40's engine fired on the third flip, but I couldn't hear it to tune it properly. Good old Ollie, even though a competitor in this flight to the death, hustled back to my plane and reached for the needle valve stem. And disaster struck.

My over-sized stunt propeller caught him on the underside of his reaching hand and almost sheared off his right thumb. Blood fanned back over the fuselage and out across the wing.

Instead of calling off the meet, Ollie wrapped the wound in a red bandanna, and went to the control handle of his Fokker.

Big John's Wing started easily, but he was never able to get it tuned correctly. This was to be the Wing's undoing.

Ollie, Big John and I stood in a tight little semicircle, the control handles extended. "Well," said Big John. "Let's get it on."

Ollie's Fokker waddled across the wet bumpy field and lifted off. When his plane was directly in back of me, my P-40 was released. It made a couple of false takeoffs, settled back to the gummy earth, hit a clump of brush and literally bounced into the air, tail down. "Hell of a takeoff you got there," snorted Big John as his fuel-soaked Wing whooshed gracefully into the air. Big John lofted his Wing into a loop and came down on the Fokker's tail, just as the slower plane was completing its first lap. Ollie hauled the Fokker up and over on its back, so that it was speeding upside down at my P-40, still barely airborne on its initial lap.

I dropped the nose over and the Tiger fell like a brick. A couple of critical yards from the ground. I jerked back on the handle, and its heavily loaded

wings actually bowed under the lurch of the pull up. All three of us were now upside down, stacked about ▪ yard apart. Inside the control circle, all three of us were beginning to stumble over each other's feet.

It was dark enough now to see the little furnaces of the exhausts and the dots of the penlights. It was also dark enough to ▬ that Big John's exhaust was streaking back too far—back to where the fuselage was soaked with fuel.

My P-40 was still slow, and losing altitude. I pulled it out of the upside down altitude just as Ollie had the same idea. The clumsy Fokker gutted into my Tiger just behind the wheels. We made a lap locked together, but Ollie chopped the triplane into a dive and broke loose. Balsa wood and tissue paper floated down.

My own plane staggered, but recovered. As fuel was burned off, it became more maneuverable. I looped on the Wing, but Big John parried with a counter-loop and knifed through the Fokker's rudder.

The Wing suddenly exploded in white flame, but the engine continued to run and Big John made two more attacks before the airplane disintegrated before his eyes. I heard the cheers as it crashed nearly at our feet.

So it was me and Ollie, and Ollie was bleeding profusely now from the cut. But the ungainly Fokker was above my P-40, with another two or three minutes of fuel left.

I put the Tiger in a shallow dive, then pulled up in ▪ hairy loop that cut directly in front of the Fokker's propeller. I was out of danger, but our lines were twisted together. Ollie and I exchanged handles, maneuvering the lines free as we'd learned with the small airplanes. When we re-traded handles, I noticed his arm was red to the elbow.

"Wanna quit?" I yelled.

"Not 'til I get that damn P-40!" he yelled back.

My plane was just behind his now, the yellow buzz saw of my prop ready to bite away his rudder and elevators. The contest was over. Or would have been if I hadn't underestimated Ollie. He put the beat-up Fokker into a shallow dive, and I followed. He aimed straight at the canyon wall, and at the last possible instant pulled it out. But instead of straightening out, he went into ▪ steep, high loop, my P-40 right with him. Over ▬ went and back like two bullets toward the sheer embankment. He pulled the Fokker up and cleared the wall. My P-40 had just begun its screaming lift when the world went silent. Both engines had stopped, and Ollie had tricked me. The P-40 hurtled into the top of the cliff. The Fokker glided to ▪ muddy landing and Ollie collapsed.

So the score that rainy evening was: two expensive airplanes destroyed; one severely damaged. Worst of all, our chief mechanic and recent escadrille champion was severely injured. We were ▪ depressed bunch of guys as we gathered up the biggest pieces of our respective airplanes.

Lt. Oldham, undoubtedly wondering how he was going to explain Ollie's injury to his superiors (all injuries must be reported) shook his head and walked away. We figured it was the end of the Black Mountain Air Force.

And it would have been except for an incredible coincidence. They brought Ollie back at midnight with some 25 stitches in his right hand. But he also had something else: a whole box of aircraft parts. Lines, control handles, bellcranks, landing gear, props, a brand new 29 engine and a big smile.

"What did you do," I asked in astonishment, "burglarize a hobby shop?"

"Naw," explained Ollie. "The doc who sewed [redacted] up is president of the model plane club in Guerneville. He *gave* us all this stuff!"

And so, the Black Mountain model airplane fleet is still flying—kept alive by a generous act on the part of [redacted] private citizen, and the enthusiasm of convicts who recognize the symbolism of wings, certainly, but also because it was just plain fun.

Before I left the camp on parole, I asked Ollie about the maneuver that won him the dogfight and cost me a P-40.

"Books," he said. "Read where Baron von Richthofen pulled the same stunt in [redacted] real dogfight."

And Richthofen didn't even have the advantage of knowing the exact moment his opponent would run out of gas.

MODELER MAIL

(Continued from page 6)

When properly set up, the PRE-60 can be expected to turn 39,600 rpm on FAI fuel, and my prototype has proven to be a real winner in our local 1/72 midget races (times in low 1:10's).

Despite the errors, I'm sure Bob appreciated the plug. Keep up the good work.

David W. Hardiman
Camp Pendleton, Calif.

Changing Times

After so many years away from flying (10-12 years), I am surprised at some of the changes in covering materials and the use of foam. I am even more surprised at the prices of the various kits that I used to build and fly. I am happy to see that the prices of many engines have not gone up to any great degree.

I now have a son and daughter who will be joining me in the building and flying of planes. One question: what's all this about mufflers? I don't want to fly planes with mufflers on them, unless this is some AMA regulation that I [redacted] not familiar with. Thanks for any help you can give.

Dennis D. Gaunt
Oskaloosa, Iowa

The most gratifying thing about the new materials in our hobby is that they

make it very painless for people, like yourself, to find their way back into the modeling fold. We hope you (and your family) can really make the most of this new technology.

Regarding mufflers, the AMA strongly advocates the use of mufflers. Many events, CL Stunt, RC Pattern, etc., require mandatory silencers. All this about mufflers is common sense and good PR.

—Editor

The Law of Supply and Demand

Last week I had the opportunity to purchase Dave Platt's new Spitfire. I was very impressed with the planning that constituted the production of this model.

I have been a modeler for over 20 years (I am now 28) and have, in that time, gained some local recognition in the field of modeling.

My observation is the following: Quite often, new companies select the same stereotype models to kit. For example, several manufacturers are now kitting P-51s, FW-190s, BF-109s, Spitfires, etc.

The JU-87 Stuka, Hawker Typhoon, and Macchi C-202, to mention a few, were equally famous and would provide good subjects, but yet, to the best of my knowledge, have never been kitted for RC use.

Is there a reasonable explanation for this phenomenon? Are you aware of

any companies that do kit the above mentioned aircraft?

Alfred J. Trapanese
Monmouth Beach, N.J.

A quick check shows that both Bob Holman and Bud Nosen (see their ads in **AAM***) have a JU-87 kit available. These two companies, as well as ■ few others, have a variety of the more esoteric models (they used to be esoteric, until someone finally learned that exact scale models do fly).*

Consider that most new companies will venture the path of least buyer resistance, and people always buy things like Spitfires, P-51s, etc. Can you blame them? When they become firmly established businesses, they often branch out into what are considered the less run-of-the-mill models. At this point, Dave Platt Models has set ■ precedent in quality that most modelers would welcome, over and above any notion of the commonness of the plane chosen for kitting.

—Editor

Electrics Are Noiseless

After reading all about those wonderful electric motors for our RC planes, I suddenly had an attack of memory. I recalled those Galloping Ghost rigs that you and I have flown in the past. Those little electric motors were going all the time, and after many flights (usually somewhere over 100), the brushes on those motors would get

TESTS/SIMPROP

(Continued from page 37)

drive. Then through four regular nylon gears drives the output. Transit time is ■ sec. and output thrust is a healthy 10 lb. Feedback pots ■■ carbon elements deposited on composition backing, about 1/32" thick, mounted to a 1/16" plastic frame. Electronics consist of ■ set of discrete components mounted on ■ board and potted. This board is, in turn, mounted on another board which also contains a centering resistor and ■ capacitor, in the retract servo, the board also contains two trim pots to adjust throw in each direction. The potted board can be considered similar to an IC in function and must be replaced in its entirety if a component fails. Output transistors are integral to the potted board. The case of the standard servo ■ in three sections. The center section, on which all mechanical components are mounted, is completely enclosed within the top and bottom sections. The bottom section provides the mounting lugs.

Editor's Note: Since the Simprop system is now my personal set, I'd like to add some subjective comments to Jim's technical inspection of this system. While the transmitter can be comfortably handled by itself, the accessory "Simprop Assistant" plastic support cradle gives fantastic flying comfort. The set is fully supported ■■ a horizontal attitude at elbow height by an arrangement of neck straps. The Assistant is also suitable for American radios. The charger for this system is available for American house current operation, but ours isn't. Too bad, because it also has an output for recharging ■ heavy-duty glow-plug lighting battery or your field kit's 12 volt motorcycle battery. The system is readily available throughout Europe, but distribution in the U.S. is not established ■■ of this time. Perhaps?

—Ed Sweeney

noisy and swamp the receivers. Then you had of those frequent and exasperating GG crashes.

Now it seems have much larger, heavier loaded, and longer-running electric motors. However, no one has spoken of the problem which was only discovered late in the GG period. Is it possible that these electric motors will also begin to throw arc signals into our receivers after while?

Stew Vance
McLean, Va.

We have not encountered any noise problems with the motors, even after a tremendous amount of electric flight. This may be due to the fact that the batteries (which power the motors) are, themselves, capacitor, and therefore, able to absorb the noise spikes. With the exception of the Mattel SuperStar, none of the electric motors we have used required a capacitor. Furthermore, we have not experienced any radio interference difficulties, when deliberately turning the transmitter off while the model was in flight.

—Editor

AVENGER

(Continued from page 54)

canopy very carefully, as dope thinners do unreal things to acetate. Epoxolite or Micro-Balloon fillers a blessing for beautiful and secure fillets. Follow the directions and mix carefully, because some of these fillers are a little touch to sand.

Outline and maskoff the entire canopy works with a double layer of masking tape. Caution! There are no "deals" bargains on masking tape. Buy good brand, and seal the canopy very carefully, dope thinners do unreal things to acetate. Epoxolite or Micro-Balloon fillers are a blessing for beautiful and secure fillets. Follow the directions and mix carefully, because some of these fillers are a little tough to sand.

Add all the little "extras" that make

Always spray paint with proper protective gear. There are no impression points for color-coordinated lungs.

a stunt judge "freak out!" Use nickel-plated brass for the exposed fuel fill tube. Nickel-plated brass tubing also looks great when slid over the landing gear wire before final bending. Take the extra time to really make that cowling and spinner fit. I've found it easier to wait until the plane is complete before adding the brass tubing air exhaust outlets. Machine polish that muffler and

spinner with a compound, or paint the spinner to match the fuselage. If dope is used, don't forget the primer undercoat. Chipped paint looks ratty on an aluminum spinner.

A few comments concerning the use of dope for finishing that new stunt machine: Enamel, Hobbypoxy, or dope, what ever is fair! I've used Aero Gloss over the years, simply because I haven't had the time or guts to play with the other methods. Like everyone, I have had my own nightmares many times over, and the Avenger was no exception. Pactra was kind enough to send me a special brew which was to be an improvement over the older batches. I'll give these good people credit for a super public relations job, and their letters were most helpful. You know why I prefer a dope finish if you have ever had the opportunity to marvel at the finishing techniques of Jim Silhavey, Tim Dunlop and Dave Geirke. You'll know exactly what I'm talking about when I say, "Nothing beats tender loving care and an Aero Gloss finish."

Curing time between coats is most important, if we can expect one coat of dope to lay over the previous one, and not just blend or soften the under layers. If we don't allow proper curing, we can expect brittleness, blisters, excessive shrinking of the finish and all kinds of nightmares. Never try to rush a finish!

The first objective of a good finish is to seal the sanded model with at least three coats of clear. If you use wet covering techniques, that wood *must* be sealed. Otherwise the water will swell the exposed balsa fibers, and your carefully sanded surfaces will become just another one of those lovely nightmares. After this, my technique is the same as many others. The Avenger was painted white, because of better visibility, and because it looks "sanitary." The lighter colors are recommended; however, keep in mind that they are also heavier in paint solids and add weight quickly. They tend to be slightly chalky, and require sealing with final coats of clear dope. If anyone has a foolproof method of keeping the final coats of clear from yellowing over a period of time, I'd love to share in their secret.

After rubbing out that finish with a fine white grade of polishing compound, try "Mac's No!" polish, which is a new concept in polishing and waxing materials. The creamy consistency permits greater wax content and polishing efficiency. After a few applications between flying sessions, that dope finish will really take on a gloss.

If you decide that the Avenger will be your next season's hopeful, you'll find that it is one of the grooviest, best turning stunters around. It will more than hold its own with any of today's stunt machines. If you should run into a snag, or have a few comments about the Avenger, I'd be most interested in hearing from you. Don Shultz, AMA 36622, P.O. Box 89163 Zenith Branch, Seattle, Washington 98188. Telephone: (206) 824-5280. Good luck with your Avenger and, "Hey fellas! Watch da lines! Huh?"

FAST START SET

(Continued from page 60)

If you can manage to talk an assistant into joining you for some cold weather flying, she will appreciate having an AAM Glowdriver (and so will you).

the troubleshooting hints given in Charles McCutchen's Glowdriver article.

Hopefully, all will be well, and the dummy glow plug (light bulb) will glow nicely, but not overly bright. Listen to the little beauty pulsing away as it does its glowdriving number! Turn the pot clockwise, and the light should increase in brightness. Turn the pot back down and connect leads to a glow plug. Now, turn the pot clockwise until the plug glows a nice cherry red (not too hot or you'll burn it out). Your Glowdriver is now ready to operate with that particular glow plug. Changing glow plugs will require readjusting the pot, and you should always begin with the pot turned fully counter-clockwise.

Insultate the bottom of the p.c. board with tape, to prevent shorting, or install the board in the box with clear medium fuel tubing spacers over the mounting screws.

Now you've got it. You are the first with the mostest on the flight line, and your Glowdriver makes you a member of the fast start set!

PARTS LIST

FIXED RESISTORS

Schematic No.	Value	Identification
R1	12 ohm, ten watt	[illegible] (Radio Shack No. [illegible])
R2	68 ohm	[illegible]
R3	15K	[illegible]
[illegible]	1K	[illegible]
[illegible]	270 ohm	[illegible]
[illegible]	180 ohm	[illegible]
[illegible]	100 ohm	[illegible]
[illegible]	33	[illegible]
[illegible]	22 ohm	[illegible]
	POTENTIOMETER	**Radio Shack Cat. No.**
R?	500 ohm	271-22[illegible]
	CAPACITORS	
C1	.022 mf	
C2	.47 mf	
C3	.22 mf	
C?	.02 mf	
	ELECTROLYTIC CAPACITORS	(The value in microfarads)
[illegible]	1000 mf	[illegible]
C5	25 mf	[illegible]
C?, C4	10 mf	[illegible]
	TRANSISTORS	**Radio Shack Cat. No.**
[illegible]	Any good switching type NPN	276-608
[illegible]	[illegible] NPN	276-2019
		276-2020
		[illegible]
[illegible]	[illegible]	276-606
	DIODES	
Quantity	**Description**	**Radio Shack Cat. No.**
10	[illegible]	276-5[illegible]
1	[illegible]	276-582
1	[illegible]	276-620
1	[illegible]	276-622
1	light emitting (red)	276-041
	MISCELLANEOUS	
1	[illegible]	272-1141
1	[illegible]	275-252
1	GE [illegible] (high intensity bulb as "dummy" glow plug)	

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SEE PAGE 86

MODEL AVIATION
Official Magazine
Editor: Carl Wheeley

AMA NEWS

ACADEMY OF MODEL AERONAUTICS
806 Fifteenth Street, N.W.
Washington, D.C. 20005

World's Largest Sport Aviation Organization

It's AerOlympics Time!

What may be a once in a lifetime opportunity to see the world's finest models will occur during the first week of July at Lakehurst, N.J. That's when and where the U.S. will host, for the first time, three World Championships: Control Line Scale Models, Radio Control Scale Models, and Indoor Rubber-Powered Duration Models. Never before have these premier events been scheduled for this country, and the likelihood of a repeat performance in the near future is remote. It's also a first for Radio Control, Free Flight, and Control Line events of such prestigious nature to be combined in competition involving so many nations. Teams are expected in this country for the first time from Czechoslovakia, Poland and Yugoslavia; many other countries will also be represented.

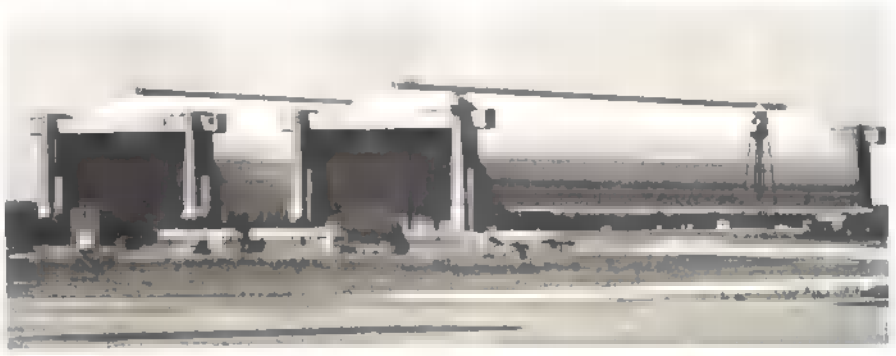
All of this is to say that if you have a chance to attend, you shouldn't miss it—admission is free! What's more, during the same period and at the same place (Lakehurst Naval Air Station) there will also be Limited International Contests (one step in stature beneath World Championships) for Radio Control Pylon Racing Models and Radio Control Gliders. These events, plus the Old-Timers' Nationals and an open Indoor contest, are all operating under the AerOlympics title.

BOOSTER SUPPORT NEEDED. Those who donate $10 or more to the AMA 1974 AerOlympics Fund will receive a booster package containing identification to gain access to a preferred parking area, an official embroidered emblem patch, self-stick parking bumper stickers and souvenir emblems, and the official program booklet. What with the event being held on a military field, it is not possible to charge for admission or parking as might otherwise be done to cover meet expenses. Donations for booster packages will help make ends meet. Sign up now as a booster; send $10 or more to AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005.

How many of the more than 50 member nations of the Federation Aeronautique Internationale will be competing was not known when this was written in mid-April, but more than 200 people from 18 nations have indicated interest in a charter flight from Europe to the U.S. to attend. This seems to point to the World Championships being as big or bigger than when they were held in Europe. But this won't be known for sure until the entry form deadline in early June.

Each of the three World Championship events is limited to three team members per nation, but except for flyers from the U.S. and Canada, entry in the two International Contests is not restricted; U.S. and

(continued on page AMA 7)



Top: One of these airship hangers will be the Indoor WC site. Above: AerOlympics planners surveying facilities at Lakehurst NAS. L-R: Joe Beshar, ass't. O-T CD; John Worth, AMA executive director; George Buso, Scale CD; Earl Witt, AMA secretary-treasurer; Don Clark and George Durney of the ECSS, the latter Soaring CD; Jack Bolton (walking up), Navy coordinator; Ron Morgan and John Spalding, VP's of AMA districts III and IV.

Executive Council Winter Meeting

The council assembled at 8 am on March 9, 1974, at the Downtowner Motel, Lake Charles, La. The following were in attendance: President John Clemens, Dallas, Tex.; Secretary-Treasurer Earl Witt, Chambersburg, Pa.; Executive Director John Worth, Fairfax, Va.; Vice-President, District I, Cliff Piper, Atkinson, New Hampshire; VP-II, Josh Titus, Paramus, N. J.; VP-III, Ron Morgan, Scotland, Pa.; VP-IV, John Spalding, Lanham, Md.; VP-V, Jim McNeill, Birmingham, Ala.; VP-VI, Glenn Lee, Batavia, Ill.; VP-VII, Jack Josaitis, Dearborn, Mich.; VP-VIII, Murry Frank, Wichita Falls, Tex.; VP-IX, Stan Chilton, Wichita, Kansas; VP-X, Alex Chisolm, Fresno, Calif.; VP-XI, Homer Smith, Seattle, Wash.; Associate VP-VII, Hardy Brodersen, Birmingham, Mich.; AMA Technical Director Frank Ehling, Laurel, Md. The meeting began at 8:20 am with the President noting that all AMA council members were present, without proxies, and one Associate VP. The meeting then proceeded directly to the agenda items.

1974 Nationals

Earl Witt (Sec.-Tr.), chairman of the Nats Executive Committee, reported on the NEC's January 9th meeting and the recommendations to the council which resulted from that meeting:

a. Mid-week to mid-week schedule (except for Indoor events which begin on Sunday).

b. All inclusive dates of August 4-15.

c. All rule book events on the schedule, whether official, provisional, or supplemental, would be listed on the entry form; AMA to collect fees and provide awards for all such events.

d. Schedule of events ▬ previously published in tentative form following January 9 NEC meeting, but with some changes subsequently deemed to be necessary; final version as per the Nats entry form (also printed ▬ June "AMA News"). Basically, the changes consisted of changing some events from one day to another and to schedule Class D (FAI) Pattern rather than Class C.

e. Camping fees—$2 per day per campsite on the Nats airfield.

f. Dormitory fees—$1 per day per person above cost ($3 or $6); AMA to collect fees and make berthing arrangements.

g. Officials' reimbursement—same for all: 3¢ per mile less 200 mile radius, plus $10 per day worked for event directors, assistants and judges.

h. Work table rental—$1 per day, $5 minimum.

i. Late entry up to 5 pm on the day before event (or the day of transmitter processing for an RC event, or the day for model turn-in for Scale).

After considerable discussion of schedule change details and apparent consensus by all concerned, Frank (VIII) made a motion to accept the committee recommendations; Lee (VI) seconded; approved unanimously.

Although the basic subject had been covered by the recommendation and voting just concluded, Chisolm (X) asked for

(continued on page AMA 4)

Exemplifying ▬ interest of Lake Charles in AMA and the National Contest was the appearance of Mayor Jim Sudduth, standing, at the March 9 meeting of the Executive Council (AMA's board of directors). AMA vice-presidents shown around the conference table, starting at left: Cliff Piper, Dist. I; Glenn Lee, VI; John Spalding, IV; Alex Chisolm, X; Jim McNeill, V; Josh Titus, II; Murry Frank, VIII; and Jack Josaitis, VII. Technical Director Frank Ehling is ▬ extreme right. Council members in attendance but not ▬ picture: President John Clemens, Executive Director John Worth, and Vice-Presidents Ron Morgan (III), Stan Chilton (IX) and Homer Smith (XI). An important part of the council's business was finalization of National Contest details which are contained in this report and also ▬ last month's "AMA News." National Contest entry forms ▬ now available; request from AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005. Send a pre-addressed and stamped (10¢) envelope.

Nominations and Elections — for Your Officers

PRESIDENT'S MEMO

My congratulations to the AMA membership! After having chaired the Executive Council meeting in Lake Charles, La., on March 9th, it makes me very proud to offer you my opinion of the present AMA Executive Council. Since the council is elected by you, the AMA membership, it gives me great pleasure to tell you that I believe you have elected the strongest, most responsive, and most dedicated council AMA has ever had! If I am correct, it would be wise for you to take advantage of this fact and move closer to your representatives on the council. Don't forget, **you** ■■■ AMA!

And because we are a dynamic moving organization there is always need for review and change. To keep our viewpoint and energy fresh, our elected officials each serve a two-year term, with half of the Executive Council up for change each year.

Although these elected officials make AMA's decisions and establish AMA's policies, **you** ■■■ **still more important than they are,** because **you** choose them through **your vote.**

There will be an election later this year (in October and November) which will be in keeping with the rotating policy. In this election the AMA president for 1975 and 1976 will be chosen, to be voted on by the entire AMA Open age membership. All such members in the even-numbered AMA districts will also vote on vice-presidents for these districts for the years 1975 and 1976. This means that members within AMA Districts II, IV, VI, VIII, and X will vote for their respective vice-presidents. The remaining elective officers were chosen last year; they will be up for vote again in 1975. This system of an overlapping council works remarkably well, preventing any abrupt change in the direction of AMA's leadership.

In the process of electing our officials, the first step is to nominate candidates for these offices. Nominations can be made by any AMA Open age class member as per procedures printed in the "AMA News" section last month—or you can write to AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005, for a copy of the nomination procedures. Nominations should be submitted to your district vice-president or to AMA Headquarters by August 1. The nominations will be considered by the Nominating Committee which will meet during the Nationals at Lake Charles, La. The Nominating Committee is made up of the district vice-presidents from all eleven AMA districts.

To anyone who may have wondered if AMA President John Clemens is ■ model flyer, let us put your mind ■■ ease. That's Johnny Clemens taking a brief respite from the sun under the wing of his Zipper, just about the hottest Free Flight of the day back in 1939 when this photo was snapped by Ernie Linn (AMA 69640, formerly ■■■■ 4401) ■■ the National Meet in Detroit. (Actually we don't know anyone who has questioned Johnny being a modeler.)

Nominations and elections are probably the most important part of AMA's affairs in which the membership can participate. These nominations and elections will not only decide who will lead AMA and establish its policies, but these same elected officials will be the ■■■■ to **appoint** ■■ **other AMA officials and committees.** Each member who is eligible to vote should feel it is his sacred obligation to help choose the leaders who will decide how your dues money is to be spent and in what direction your hobby/sport is to be aimed. This is a way you can insure yourself of getting the most from your hobby/sport and the investment you put into it. Here is a perfectly legitimate way to be selfish!

A bit of advice on nominating and voting—choose your leaders in the same manner as you would if you were **hiring them** to do the job. **Do not** be so foolish as to make an AMA election into ■ popularity contest. With AMA now being a 50,000 member organization, it is far too important a part of your community for you to just elect the best flyers or the most popular personalities. Probably the most important qualities to look for in an officer prospect should be his ability and willingness to communicate, his eagerness to represent and please **all categories and interests,** his depth of experience and knowledge of AMA's history and problems, and lastly, his vision into the future for the Academy of Model Aeronautics and each individual member of the organization.

I am sure that I have, by now, impressed you with the gravity of entering into AMA's election of officers. **But don't overlook the fun of belonging** and actually being a part of the fine progressive organization that AMA is. And who knows, in the future we members may ask you to serve in one of our high offices. I think you will find it is fun to enter into AMA's affairs beyond just paying dues, and it all comes for the same price!

John E. Clemens
AMA President

Executive Council Meeting

(continued from page AMA 2)

further consideration concerning officials' reimbursement. He noted that the travel compensation was inadequate to ensure availability of top quality officials and that this could result in a Nats of lesser stature. Further discussion by various council members indicated that while this was a serious concern, the Nats should live within its own income in regard to direct costs—Spalding (IV) noted that the Nats is already substantially subsidized by indirect costs involving Headquarters pre- and post-Nats support. Following further discussion Titus (II) made a motion to leave the matter of reimbursement to the Nats Executive Committee, based on the goal of break-even operation regarding direct costs. The motion was seconded by McNeill (V) and was approved by all except Chilton (IX) who abstained.

McNeill (V) then made a motion, seconded by Chisolm (X), that the Nats Executive Committee be thanked and commended for past and current services; approved unanimously (except the NEC members on the council—Clemens (Pres.), Witt (Sec.-Tr.), Morgan (III), Worth (E. Dir.)—abstained).

Frank (VIII) closed the agenda item by making a motion, seconded by Chisolm (X), that a Nats Executive Committee member, upon retirement from active service, would automatically be authorized to receive the AMA Distinguished Service Award. The motion was approved unanimously (except that, again, the NEC members on the council abstained).

1974 Budget

Noting that the council previously had been mailed a 1973 financial statement and a proposed 1974 budget which had been prepared by Headquarters, Witt (Sec.-Tr.) distributed graphs and charts, based on previous financial audits and explained his analysis of past vs. current and proposed operations. He noted in particular that expenses were rising at a faster rate than income, despite the past year's dues increase, so that a change in the trend was necessary in order to avoid a deficit situation within a year or two. He further recommended that AMA's expenditures in the PR area be reviewed for possible curtailment of those projects which were of least direct benefit to the membership. He made a number of specific recommendations for council discussion, and Clemens (Pres.) then asked for a HQ viewpoint on these.

Worth (E. Dir.) responded by noting that PR was a most difficult subject to measure in terms of concrete results vs. specific efforts. He also noted that many items of support for HQ projects were lumped under the category of PR expenses, but these were often misnamed. As an example, he pointed out that much of the AMA PR director's efforts were actually along the lines of assistance to the executive director rather than PR. Worth also noted that many PR efforts were experimental, in the nature of pilot projects, to determine whether future efforts of this type were likely to be productive. Several such projects were described and indicated to be either self-sustaining by the end of the year or they would be discontinued.

Following general council discussion of PR and other budget matters, during which there was general agreement that the budget for PR activities should be reduced and that the direction of PR projects should be changed to emphasize direct benefit to AMA members plus more national rather than regional emphasis, a number of votes were taken, as follows:

a. Chilton (IX) made a motion that only 10% be added to '73 PR (including show team) and film expenses (in place of 20% originally proposed) and that the savings be used to add $5,000 to the salary allowance approved in '73 for an assitant to the executive director. The motion was seconded by Morgan (III) and approved by all except Titus (II) who voted negatively.

b. Witt (Sec.-Tr.) made a motion to establish a policy to require all future publications (including the NAA magazine after 1974) to be optional or paid for by individual members, except for the rule book and reprint of "AMA News." The motion was seconded by Piper (I) and approved unanimously.

c. Witt (Sec.-Tr.) made another motion that all new projects be self-sustaining or be specifically approved by council decision. The motion was seconded by Smith (XI) and approved by all except Piper (I) who abstained.

d. Following discussion initiated by Witt (Sec.-Tr.) concerning the effectiveness and benefit of AMA's Scholarship Program, there appeared to be a consensus that despite dissatisfaction with the program to date, the money spent was justified and the program could be improved. Lee (VI) then made a motion to continue the program pending a report from the Scholarship Committee chairman, with council review to follow. Frank (VIII) seconded and all approved except Titus (II) who voted negatively.

e. Brodersen was then invited by Clemens (Pres.) to explain a National Free Flight Society request for AMA to match funds for a proposed NFFS Scholarship program. Brodersen (current executive director of the NFFS) then outlined the program which called for NFFS and AMA to each contribute $1,500 (annually) with matching funds from the industry anticipated. Following general discussion, Smith (XI) made a motion to table until the report of the AMA Scholarship Committee chairman is made available to the council; seconded by Witt (Sec.-Tr.) and approved unanimously.

Worth (E. Dir.) followed this vote with the suggestion that the general subject of fund matching be seriously considered as a new AMA policy. He noted that the Hobby Industry Association (HIA) had such a policy which worked very successfully to encourage the activities of special interest groups. An important side effect also resulted—the drawing together more closely of the parent organization and its special interest groups which otherwise had a tendency to split off and become autonomous. AMA's parallel situation might similarly benefit from such a policy.

Clemens (Pres.) then adjourned the meeting for lunch. Upon reassembly Clemens introduced Lake Charles Mayor Jim Sudduth, who had interrupted his schedule to visit the council and offer the hospitality of his office. Clemens thanked the mayor and noted that this was the first time that the council had been honored by such a visit. Following an exchange of personal greetings between the mayor and council members, business was resumed with a continuation of the previous agenda items relating to the 1974 budget.

f. The executive director's salary was discussed following a request by the E.D. for cost of living compensation--it was noted that while the E.D. has authority to change other HQ salaries, his own is subject to council approval. Worth (E. Dir.) then left the room so that free discussion could prevail. Upon return he was informed that the council had approved a cost of living increase of approximately 7½% plus an incentive increase of approximately the same amount.

g. Following a report by J. Gerber concerning past, current, and future AMA film projects (including a showing of a new film of the council's 1973 Winter Meeting) Chisolm (X) made a motion to accept the 1974 budget, as amended by the foregoing council actions. The motion was seconded by Lee (VI) and approved by all except Witt (Sec.-Tr.) and Titus (II), both of whom abstained.

1974 World Championships

Worth (E. Dir.) reported on planning progress for the event, including the special charter flight being arranged for foreign participants. He noted that foreign response to initial publicity had been excellent, and that the charter contract signing was expected momentarily, with a down payment of approximately $5,000 required. That amount constituted AMA's risk in the venture, as the down payment would be forfeited if cancellation is made by AMA less than 60 days before departure date of the flight. The effect of this is to give AMA until April 30 for a go/no go decision on the flight: if enough deposits are received by that date, the decision is go; if not, the decision is to cancel and forfeit the deposit.

Worth further noted that in all other respects the project is expected to be self-sustaining, with income from sponsorships, booster package sales, concessions, and other items to cover expenses. He therefore asked that the council reaffirm its earlier approval of a $5,000 budget to cover possible deficits in case expenses are not covered by income. Piper (I) then made a motion, seconded by Spalding (IV), to pursue planning with a $5,000 limit, approved unanimously.

FAI Programs

McNeill (V) reviewed the intent of the councils' 1973 Nats meeting action and subsequent developments. He quoted excerpts from his letter of January 10 to Frank Ehling (Tech. Dir.), as follows:

1. Go along with programs already in existence and change slowly, using your power to pass final judgment, settle disputes, re-align personnel, etc. Use the knowledge existing now.

2. Come to the council meeting in February or March and use our collective talents to hammer out whatever it is you want for the future.

3. Let us surgically remove this odorous, cancerous adjective, czar, from our toy airplane vocabulary and quick.

Smith (XI) then made a motion that McNeill's letter be used as the basis for guidelines for future program administration. The motion was not seconded but led to discussion and general agreement on the basic point that the technical director would share the responsibility with the president rather than the executive director and the FAI delegate.

Clemens (Pres.) then tabled discussion and invited Brodersen to explain an NFFS proposal for Free Flight (Indoor and Outdoor) team selection procedures and policies, copies of which previously had been sent to council members. Brodersen described the program and noted that it would serve to let NFFS committees develop new team programs by extensive democratic action among Free Flighters, with HQ personnel to administrate such programs—all subject to the AMA president's approval.

Considerable discussion indicated a general willingness to try the concept, for Free Flight only. Spalding (IV) then made a motion to accept the proposal on a two year conditional trial, subject to a redraft of the original proposal which would be acceptable to the executive director and the president. The motion was seconded by Smith (XI) and approved by all except that Chilton (IX) voted negatively, and Witt (Sec.-Tr.) abstained.

Titus (II) then moved to retain the same procedures and policies as before for other team selection programs (Radio Control, Scale, Control Line), with Frank Ehling (Tech. Dir.) to serve as chief administrator. The motion was seconded by McNeill (V) and approved by all except that Witt (Sec.-Tr.) abstained.

President's Expenses

McNeill (V) requested the council's attention concerning the problem of personal cost to the president in representing AMA during his term of office. He made several suggestions regarding possible means of compensation. General discussion followed in which it was noted that the previous policy approved in 1972 was too limiting concerning the president's office and that the policy should be modified so as to include AMA events as well as non-AMA events.

The net result was a motion made by Spalding (IV) that the president, or his appointed representative, shall have reimbursable expense privileges based on a monthly accounting to HQ; also that the 1972 policy relating to officer reimbursement shall be modified to apply to spokesmen designated by the president as the executive director. The motion was seconded by Frank (VIII) and approved unanimously except that Clemens (Pres.) abstained.

Publications Review

a. **Monthly Mailing distribution.** It had been previously proposed that distribution be increased to include all chartered club members as a means of improving communications to a significantly larger portion of the membership. The cost would also increase, about $12,000 per year. Discussion indicated a consensus that the budget should not be increased that much for 1974, beyond those items already approved. The council appeared to be more receptive to considering the proposal for 1975 with all Open members included rather than just club members. Noting that this question would be reviewed at the Nats council meeting in August, Piper

(I) made a motion to authorize a modest increase now, to add all Leader members, including Contest Directors, to the current circulation. The motion was seconded by Smith (XI) and was approved unanimously.

b. **AAM CONTRACT.** Worth (E. Dir.) reviewed the history of a recent controversy and noted that the climate surrounding the publication arrangement had improved considerably, mostly due to the current contract which puts the decision concerning continuance in the hands of the membership. He also noted a missing ingredient in the current contract: lack of a specific guarantee that the "AMA News" section would appear in all copies of all issues of the magazine regardless of distribution. Discussion then ensued in regard to a proposal by AAM that such a guarantee would be provided and that a number of membership promotion efforts by AAM would be initiated. The proposal included making the current contract open-ended so that the membership acceptance ratio would be the determining factor each year concerning continuance the following year. Chilton (IX) made a motion to instruct the executive director to negotiate a modification of the current contract to provide the open-end arrangement, conditional upon a guarantee of the "AMA News" being in all copies regardless of distribution and to include fulfillment of the promotional points covered in a March 5 letter from AAM to AMA. The motion was seconded by Morgan (III) and approved by all except Chisolm (X) who voted negatively and Spalding (IV) who abstained.

c. **Reprint review.** No action taken as this was simply a status report noting that there had been no problems through two issues of about 5,000 circulation each.

Insurance Programs

Two areas of interest were discussed:

a. **Bonding of club officers.** A mixed response was noted by council members, generally favorable and most preferring optional choice on the part of clubs rather than automatic coverage. Worth (E. Dir.) asked that copies of letters received by council members be forwarded to HQ for tabulation and a further report for the next council meeting. In the meantime, he would seek additional quotations with optional features concerning amounts of protection and costs.

b. **Expansion of individual member protection.** This was proposed as a means to provide more direct help to members by offering accident type coverage to supplement liability type. In most cases this would speed up claim processing and give a more favorable image of the value of protection via AMA. Noting that the cost would involve a substantial budget increase, Worth (E. Dir.) made a motion to table the subject until the Nats council meeting, for consideration as a possible 1975 membership benefit. Frank (VIII) seconded the motion which was approved unanimously.

Financial Guidelines

Several items were discussed with regard to guiding Headquarters' handling of various matters:

a. **Credit collection procedures.** Noting that AMA had a very low loss ratio from bad checks and unpaid invoices, it was generally agreed that six months was the maximum item should be pursued unless of a major nature; in the meantime, the VP of concern for the member involved would be copied in on any second notice, for information and possible help in obtaining settlement. It was noted that most problems of this sort were of consignment nature where supplies or special insurance coverages were provided short notice.

b. **Interest-bearing accounts.** After review of current procedures, it was generally agreed that HQ should pursue purchase of treasury bills in addition to savings and loan accounts, with the executive director to obtain concurrence from the secretary-treasurer on specific arrangements.

c. **Trust funds.** How FAI and other funds were administered was questioned, and it was explained that such accounts are maintained by AMA at no charge to them and that interest from the accounts is used to offset the cost of administering them. Brodersen asked whether such interest could accrue to the accounts rather than to AMA, but the council consensus was that the present procedure was satisfactory, and no action was taken to change it.

Contest Board Engine Rule Problems

Following discussion of controversies concerning interpretation problems of current Control Line Profile Carrier and Radio Control Pylon Racing engine rules, the consensus appeared to be that the council should not get involved unless the Contest Boards were unable to resolve the matters. McNeill (V) then made a motion for the council to remind the Contest Boards of their responsibility concerning such problems and also the need for these matters to be handled expeditiously to avoid further council action. The motion was seconded by Lee (VI). It was further emphasized that something more than simply letting previous interpretations stand (without further clarification) appeared to be necessary so that engine manufacturers, contestants and Contest Directors would know better what to expect during 1974 and beyond. The vote on the motion was approved by all except Titus (II) who was negative.

Permanent Nats/Museum Site

Clemens (Pres.) noted that the subject deserved more time and attention than was possible after so much council business and with so little time left for the meeting. He suggested, therefore, that further consideration be given by mail after he has a chance to put in writing his many thoughts on the subject. In the meantime he noted that both our experience at Lake Charles and the availability of still another site possibility were moving AMA strongly in the direction of a permanent Nats site without the necessity of a project action as yet. Witt (Sec.-Tr.) followed this with a motion to defer further action until another opportunity. The motion was seconded by Piper (I) and was approved by all except Chilton (IX) and Frank (VIII), both of whom abstained.

Nomination Procedures

After a short review by Worth (E. Dir.) of current procedures and a reminder of the need for annual approval of the procedures to be used for the year's election, Frank (VIII) made a motion to use the same procedures as we have been using in recent years except for necessary date changes. McNeill (V) seconded the motion which was then approved unanimously.

Special Awards

Three Distinguished Service Award nominations and one AMA fellowship nomination were approved unanimously. Details are being withheld—as is normal policy—until the awards are presented.

Certificate of Appreciation. Lee (VI) made a motion, seconded by Titus (II) that Fred Wolff be presented such a certificate in recognition of his outstanding article on behalf of AMA, the Nats, and model aviation in the February 1974 issue of *Popular Mechanics* Magazine. (Public presentation by Titus and Worth (E. Dir.) was made at March 17 at the WRAMS model show in N.Y.).

Muffler Design Contest

After discussion of past actions on this project, Clemens (Pres.) advised that he would appoint a specific committee to supplement what Worth (E. Dir.) and Don Lindley (current chairman of AMA's Muffler Committee) had done to date to develop this program. In general, it was noted that the goal was to announce the program in mid-74, with awards to be made in 1975. Support from industry would be sought concerning commercial muffler development, whereas AMA's effort would be to recognize individual AMA member design contributions. Clemens also asked Spalding (IV) to seek recommendations from the DC/RC club which was known to be involved in muffler development.

AAAA Meet Standards Review

Worth (E. Dir.) noted that the Contest Directors for the annual U.S. Free Flight Championships and the so-called Soaring Nats had sought AAAA ratings for the meets as a prestige symbol, but that HQ had felt it necessary to avoid such designations because contest coordinator guidelines would have prohibited AAA meets anywhere else in the country on the same weekends. Discussion indicated some support for the idea that such meets might be granted AAAA rating if AMA's National Contest and any World Championships could be given a higher rating, such as AAAAA. But this possibility was not pursued to a conclusion.

Instead, Frank (VIII) made a motion, seconded by Spalding (IV), that the rule book definition of national championships—as applied to AAAA meet classification—would be interpreted to mean a national or international meet sponsored by the Academy of Model Aeronautics. The motion was approved by all except Chilton (IX) who voted against.

Worth (E. Dir.) then made a motion to waive the AAAA restriction against AAA meets being held during the period of the 1974 World Championships scheduled for July 1-7 at Lakehurst, N.J. The motion was approved by all except Chilton (IX). Following this, further council discussion indicated a consensus that the Contest Boards should review and clarify the current meet classification rules and with particular regard to better defining the AAAA rating.

Contest Board Procedures

a. **2/3 Vote Interpretation.** Lee (VI) questioned what the meaning should be concerning a 2/3 vote by the council. Smith (XI) then made a motion to interpret this mean a 2/3 vote of the entire council. Lee seconded the motion which was then approved unanimously.

b. **Revote December revisions.** Worth (E. Dir.) made a motion that the results of the December '73 mail vote, which did not have a majority of the total council responding, be accepted as the official council vote for those Contest Board Procedures revision items which received a majority vote of those council members who did respond. Josaitis (VII) seconded the motion, which was then approved by all except the following: Lee (VI) and Frank (VIII) voted in the negative, Spalding (IV) and Smith (XI) abstained.

c. **Further changes.** Worth made a motion, seconded by Witt (Sec.-Tr.), that the executive director's memo of March 5, 1974, concerning CB Procedures, loose ends, be handled by mail since it was already in suitable form, and time was running out during the current meeting for proper consideration. The motion was approved unanimously.

d. **Vote required for revision.** Lee (VI) noted that the current requirement for two separate 2/3 votes by both the council and the Contest Board chairmen was complicated and confusing. He then made a motion to combine the votes so that a 2/3 majority of the total of both groups would be required to approve revisions. McNeill (V) seconded the motion which was then approved unanimously, although it was noted that this motion would require a 2/3 majority response from the Contest Board chairmen, such vote to be taken by mail.

Vote of Thanks

Several council members noted that the Lake Area Radio Kontrol Society (LARKS club of Lake Charles) had done an outstanding job to date in working to bring the Nats to Louisiana and to host the council during its meeting. Clemens (Pres.) then noted he would send a letter on behalf of the council thanking the LARKS for their efforts; this action was unanimously applauded.

Soaring Advisory Council Chairman

Spalding (IV) noted the need for a chairman of this group which had been approved by the council in a previous meeting. He suggested the appointment of Carl Maroney, of the East Coast Soaring Society. Clemens (Pres.) acted to make the appointment immediate so that it could be recorded in the meeting minutes.

Proxy Voting

Brodersen requested that the council consider the possibility of proxy voting in AMA elections. The general council response was negative, so the matter was not pursued, although Clemens (Pres.) invited Brodersen to make a more specific proposal in the future if he desired further consideration.

(continued on following page)

Inactive CD Problem

Smith (XI) described a problem concerning inactive Contest Directors. He asked that consideration be given to the deletion of CD ratings for those who have not CD'ed meets in the past two years. Smith noted the difficulty in locating current CD's willing to direct meets; that considerable time is wasted in sorting out active from inactive CD's. General discussion followed, but no consensus was apparent, so no action was taken. Frank (VIII) noted, however, that we should not forget the services rendered by CD's in previous years—when AMA really needed them—even though they may not have been active lately. Worth (E. Dir.) suggested that the problem might be better defined if active CD's were identified in computer listings, and he said he would pursue the obtaining of this information.

Adjournment

Clemens (Pres.) noted that the council had once again, as almost always, been in session past one a.m. following the day when the council meeting began. Titus (II) then moved, seconded by McNeill (V) that the meeting be adjourned; approved unanimously.

FAI Rules Modified

Correct your 1974-75 AMA rule book! When the officers of the FAI Committee for International Aero Modeling (CIAM) met in April, they approved several significant changes to the FAI Radio Control rules. Thus, some of the FAI rules in the just-printed AMA rule book are wrong. Our suggestion is to clip out this article and keep it with your rule book or else mark in the revisions by hand.

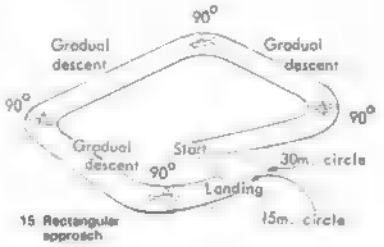
FAI RC Aerobatics

Figure M: The requirement has been eliminated for the second half-roll to be in the same direction as the first half-roll. Reason No. 11, as revised, now provides for downgrading only if the second stall turn is in the incorrect direction, and no longer is it required for this error to produce a zero score.

Cuban Eight: The requirement has been eliminated for the half rolls both to be in the same direction.

Double Immelmann: The requirement (as well as downgrade reason 9) has been eliminated for the half rolls both to be in the same direction, and references have been added to state inside and outside half-loops in agreement with the illustration.

Four-Point Roll, Eight-Point Roll, Three Horizontal Rolls: To the descriptions of each has been added that the approximate time of the complete maneuver is five seconds.



Rectangular Approach: The beginning of the description has been revised: "Model starts in level flight, into the wind over the landing area. Model makes a 90-degree turn cross wind..." The sketch also has been corrected as shown. (Following exit from the Spin, the model is allowed whatever maneuvering is necessary to reach the beginning position of the Rectangular Approach.)

FAI RC Soaring

For Thermal Soaring Tasks B and C (distance and speed), CIAM officers agreed that the model must be in gliding flight when it enters the course. (Previously, the rules did not specifically prohibit RC Motorgliders from flying the course under power.) They also indicated that contest organizers could hold an event solely for non-powered gliders or solely for Motorgliders. In a further ruling, CIAM officers said that the Graupner Cumulus did not have so much prefabrication as to prohibit it from being entered in FAI competitions.

Deadline Extended for AMA Rules Proposals

The AMA Executive Council and Contest Board chairmen have approved extending the deadline for submitting competition rules change proposals from June 1 to September 1, 1974 (postmark deadline). The primary reason for pushing back the deadline was to allow opportunity for the '74-'75 rules to be tried out before considering new changes.

The council and board chairmen also voted to allow resubmittal of proposals which were defeated in the immediately previous rules-making cycle.

Standard Rules Change Proposal Forms are available from AMA HQ. We caution everyone to keep in mind that proposals not postmarked by September 1, 1974, cannot be submitted until 1976—for possible effect in 1978-79.

RC Team Program

The three-man U.S. RC Aerobatic Team for the 1975 FAI World Championships currently scheduled for Switzerland will be selected by a Team Finals flying competition planned for the weekend of October 4-6, 1974, at the former Hutchinson Naval Air Station, near Wichita, Kansas. Thirty qualified AMA members from throughout the U.S. will be admitted to the Team Finals including 10 from the National Contest and the 1973 team members (who are automatically qualified.)

The point qualification program will be in operation from May 4 through Labor Day, September 2, to enable as many AMA members as possible to have a chance to fly in the Team Finals. Points are earned by competing in Class D (FAI) Expert events at AMA sanctioned class AA or larger meets, *except the National Contest*, and determined by a chart which takes into account both placing in the contest and number of entries.

To enter the points program, send a $10 program fee (check or money order) to AMA HQ postmarked by August 15, 1974, or pay the fee in person to AMA HQ at the National Contest by August 15. Program entrants must also have an FAI stamp ($1.25 from AMA HQ if not purchased with license). The 10 who accumulate the most points will be eligible to compete in the Team Finals.

To enter the Nats qualification program a flyer must have an FAI Stamp and pay a $10 program fee prior to the start of Nats Pattern flying (in addition to regular Nats fees). The top 10 program entrants in the Class D Expert event will be eligible to compete in the Team Finals.

The points qualification program and the Nats qualification program operate independently; the fees for each are separate, neither of which can apply to the other program. Nats placing will not count toward the point accumulation program.

All finalists will be required to pay a fee of $10 at the Team Finals site before flying, except those pre-qualified, who must pay $20 later than August 15—those who do not pay by that date will be dropped and alternates substituted at the Team Finals.

For full program details and a chart showing how points are accumulated, send a pre-addressed and stamped (10¢) envelope to Academy of Model Aeronautics, 806 Fifteenth St., N.W., Washington, D.C. 20005.

Chartered club officers who receive the AMA *Monthly Mailing* found out in May what was May's big modeling news. Did you? If not, ask your officers why not!

AerOlympics

(continued from page AMA 1)

Canadian entries in Pylon and Soaring will be kept to about 10 each to prevent swamping of facilities and to not overshadow other nations in sheer numbers. All U.S. Indoor flyers are invited to participate in the open Indoor Contest for FAI Stick models; during this period flyers may also try for world records (record rules do not restrict size or weight of models). The Old-Timers' Nationals for FF and RC/FF models, sponsored by the Society of Antique Modelers, is open to all AMA members; for entry form and more details, send a pre-addressed and stamped envelope to Woody Woodman, 389 Floral Lane, Saddle Brook, N.J. 07662.

AerOlympics Schedule

There probably will be some small variations in the final event schedule, but the basic schedule of April 15 which follows is not expected to change.

Indoor. Practice flying on July 2. World Championships flying July 3-5. Open contest July 6-7.

Scale (CL ■ RC). Practice flying and static judging July 2-4. World Championships flying July 5-7.

RC Pylon Racing. July 3-6.

RC Soaring. July 5-7.

Old Timer. A Pylon, C Cabin, Stick Rubber, Cabin Rubber, Old Timer Class A (RC), Old Timer Class ■ (RC), Scale Rubber: July 2. ■ Pylon, A Cabin, .020 Replica, 30-Second Antique, Old Timer Class C (RC) .301-.45, Old Timer Class D (RC) .451-.61: July 3. C Pylon, B Cabin, Old Timer Class .020 Replica RC, Antique RC: July 4.

Officials

A blue-ribbon panel has been arranged. AMA Contest Directors for the World Championships are George Buso (Scale) who has had much experience with the huge Rheinbeck meets and Bob Champine (Indoor) who previously has been the AMA Indoor Program administrator and director of Nats Indoor events. Burt and Bernice Williams will handle the CD chores for Pylon Racing, while George Durney will head up Soaring.

The FAI Jury is composed of Sandy Pimenoff, Finland, president of FAI's Committee for International Aero Modeling (CIAM), Helmut Ziegler, Switzerland, chairman of the CIAM Scale Subcommittee; and John Spalding, U.S.A., member of the AMA FAI Activities Committee and also AMA District IV vice-president. Reserve: Luigi Bovo, Italy, CIAM vice-president. The Jury has the duty to rule on disputes and oversee the proper conduct of the contest.

Scale Judges, who will give out points for both static and flight aspects and for both Control Line and Radio Control, are D. Thumpston, Gt. Britain; L. Weber, U.S.A.; S. Zwahlen, France; A. Aarts, Netherlands; and Z. Kalab, Czechoslovakia. Reserves: C. Milani, Gt. Britain; M. Perrone, Italy.

Accomodations

Most male contestants and contest officials who do not bring their families will be housed aboard Lakehurst Naval Air Station. But some contestants will be bringing their wives, and they, plus others for whom provisions cannot be made at Lakehurst, will stay at the *Irvington* in Lakewood, N.J. This is a combination hotel-motel which will be headquarters for the AerOlympics.

There are a limited number of rooms at the Irvington for AMA members who wish to attend the AerOlympics but who are not connected with the contest operation. *Such bookings must be arranged through AMA HQ:* send a check or money order quickly inasmuch as AMA can offer no other assistance once these rooms are sold out. The deluxe *motel* package is $140 *per person* for seven days, including two meals per day and all tips (daily rate, $28). The *hotel* package is $125 for seven days ($25 per day). All packages are based on two persons per room, two meals per day. Those interested should keep in mind that this is a peak holiday season, making accomodations scarce and costly.

The AerOlympics is unique. It is many things in one—a lucky combination of events not likely to be seen again in one package. It was put together by officers of the Academy of Model Aeronautics who acted quickly when the opportunity developed for combining normally separate events at the same time that Lakehurst Naval Air Station was available. They had to work with little time and money but lots of imagination and spirit. The result is ■ very special week-long program of aeromodeling history in the making—well worth whatever it takes for anyone to get there to enjoy the show.

Contest Calendar

Official Sanctioned Contests of the Academy of Model Aeronautics

Note: For quick response and ■ ■ favor to those staging, administering and directing the contest, be certain to send ■ stamped, self-addressed envelope along with your request to ■ listed Contest Director (CD) for additional information.

June 1—Enumclaw, Wash. (A) RAMS RC "A" Pattern and Helicopter Meet. Site: Enumclaw R. Foote CD. 3029 48th Ave. SW, Seattle, Wash. 98116. Sponsor: Radio Aeromodelers of Seattle.

June 1-2—Memphis, Tenn. (AA) Memphis RC Meet. Site: Club Flying Site. R. Roberts CD. ■ Box 34268, Bartlett, Tenn. 38134. Sponsor: Memphis RC Club.

June 1-2—Rochester, N.Y. (AA) 15th Annual RC NY State Championships. Site: ■ T. Salvemini CD. 6 Valley Ln., Avon, N.Y. 14414. Sponsor: Radio Control Club of Rochester.

June 1-2—Ft. Lee, Va. (AA) M.V.R.C. Spring Classic. Site: Ft. Lee Flying Site. F. Gregg CD. ■ Richmond ■, Chester, Va. 23831. Sponsor: Mid Virginia RC Club.

June 1-2—Shreveport, La. (AAA) 11th Annual CL Louisiana State Model Airplane Championships. Site: Hobby Park. H. Hunton CD. 9529 Pitch Pine Dr., Shreveport, La. 71108.

June 1-2—Baton Rouge, La. (AA) Baton Rouge RC Club 13th Annual Meet. Site: Kleinpeter Field. L. Bou■■■ CD. 1739 Oak ■, Baton Rouge, La. 70815.

June 1-2—Lincoln, ■■■. (AA) Lincoln Sky Knights 15th Annual ■■ Contest. Site: LSK Field. R. E. ■■■■ CD. 3230 S. 40, Lincoln, ■■■ ■■■■. Sponsor: Lincoln Sky Knights RC Club.

June 1-2—Valley Park, Mo. (AAA) GSLMA Gateway CL ■ ■■ Championships. Site: Buder Park. W. Reich ■■, 10821 St. Xavier Ln., St. Ann, Mo. 63014.

June 2—Ft. Lewis, Wash. (A) ■■■■ Spring Opener. Site: Harts Lake Prairie. D. Dodd CD. 10548 32nd Ave. SW, Seattle, ■■■■ 98146. Sponsor: Boeing Charter Hawks.

June 2—Warminster, Penna. ■■■ Golden Eagles "Early Bird" Indoor Annual. Site: Johnsville N.A.S. J. Kutkuhn CD. 517 Georgetown Rd., Wallingford, Pa. 19086.

June 2—St. Paul, Minn. (A) 2nd Annual North Central Pylon Meet. Site: St. Paul RC. R. Steine ■■, ■■■■ Louisiana Ave., S., St. Louis Pk., Minn. 55426. Sponsor: St. Paul RC'ers, Inc.

June 2—Oklahoma City, ■■■. (A) Air Lemans ■■ Pylon meet. Site: TORKS Field. C. Brownlee CD. 3033 Rolling Stone, Oklahoma City, Okla. 73120.

June 2—Wyandotte, Mich. (B) Indian City Fun Fly. Site: Wyan-■■■, E. Lynn CD. 3167 22nd, Wyandotte, Mich. 48192. Sponsor: Indian City ■■ ■■■ Inc.

June 2—Chandler, Ariz. (AA) BBMFC CL Mini-Meet. Site: Galveston School. G. Smith CD. 1293 W. Toledo St., Chandler, Ariz. 85224.

June 2—New York, N.Y. (AAA) Forest ■■■ CL M.A.C. ■■■ Site: Flushing ■■■■ Park. ■ Sobrino CD. 87-26 88th St., Woodhaven, N.Y. 11421.

June 2—Kirtland, ■■■. (AA) Prop ■■■■ CL Contest. ■■■ Lakeland College. ■ Tegel CD. 452 E. 328th, Kirtland, Ohio. Sponsor: Prop Busters.

June 2—Pasadena, Tex. 2nd Annual ■■■ Barron RC Fun Fly. Site: Red Barron Flying Field. W. Beckham CD. 806 Grove Ave., Deer Park, Tex. 77536. Sponsor: Gulf Coast RC Club.

June 2—Glastonbury, Conn. (A) Old Timer Spring FF Rally. Site: Glastonbury G. Armstead CD. 69 Harvest Ln., Glastonbury, Conn. 06033. Sponsor: SAM-7.

June 2—Hadley, Mass. (A) Sport Scale & Fun Fly Meet. Site: Hampshire Co. RC'ers Field. F. Mitchell CD. 290 Notre Dame St., Westfield, Mass. 01085. Sponsor: Hampshire County Radio Controllers.

June 2—Spring Valley, Ill. (A) Annual IVRC RC Contest. Site: Spring Valley Airport. H. Sutherland CD. 303 Thompson, Princeton, Ill. 73975. Sponsor: Illinois Valley RC Club.

June 2—Bowie, ■■■. (A) DCRC Soaring RC Meet. ECCS. Site: Old Bowie Airport. J. Spalding CD. 5803 Ellerbie St., Lanham, Md. 20801. Sponsor: DCRC Club.

June 2—Greenville, ■■■■. DCAMA RC Fun Fly Meet. Site: Weaver Station ■■. R. Johnson CD. 320 Moody Ave., Bradford, Ohio 45308. Sponsor: Darke County Aeromodelers Assn.

June 2—Bellville, Mich. (A) Class A 1/4 Midget RC Pylon Race. Site: 8830 Rawsonville ■■. W. Yeager CD. 6323 N. Wayne Rd., Westland, Mich. 48185. Sponsor: Signal Seekers RC Club, Inc.

June 2—E. Bridgewater, ■■■■. South Shore RC Meet. Site: State Correctional Institute. S. Rizzotto CD. 31 N. Lillian St., Randolph, Mass. 02368. Sponsor: South Shore RC Club.

June 8—Lakehurst, N.J. (A) R/V R/C Multi-Wing Championships. Site: Lakehurst ■■■. B. Schroeder CD. 18 Spencer Rd., Glen Ridge, N.J. 07028. Sponsor: Rockaway Valley RC Club.

June 8—Salem, Ohio. RC Short Circuits Fun Fly. Site: Quaker City Drag Strip. J. Marshall CD. RD #5, Lisbon, Ohio 44432. Sponsor: RC Short Circuits. ■■■

June 8-9—Kansas City, Mo. (AA) Kansas City RC Annual. Site: Kansas City R. Jennings CD. 7400 E. 85th Terr., Kansas City, Mo. 64138. Sponsor: Kansas City RC Assn.

June 8-9—Midland, Tex. (AA) West Texas Regional FF, CL & RC Championships ■■■. Hogan Park. B. Boyd CD. Star Rte. B, Box 10, Midland, Tex. 79701. Sponsor: Flying Chaparrels.

June 8-9—Nashville, Tenn. (AA) 11th Mid-South RC Championships. Site: Nashville B. Reuther CD. 216 Vaughns Gap Rd., Nashville, Tenn. 37205. Sponsor: Middle Tennessee RC Society.

June 8-9—Elk Grove Village, Ill. (AA) Chicagoland Lucky 13th Annual RC Contest. Site: ■■ Grove Village. ■. Mueller CD. 3742 N. Nottingham Ave., Chicago, Ill. 60634. Sponsor: Chicagoland RC Modelers, Inc.

June 8-9—Monroe, N.C. (AA) MR/CC Air Races. Site: Monroe RC Club. B. Helms CD. 800 Tyvola Rd., Charlotte, N.C. 28210. Sponsor: Monroe RC Club.

June 8-9—Billings, Mont. (AA) B.F.M. Annual RC Spring Fun Fly. Site: ■.F.M. Field. R. Wilson CD. 3225 Phillip, Billings, Mont. 59102. Sponsor: Billings Flying Mustangs.

June 8-9—Pensacola, Fla. (AAA) Fiesta of Five Flags SE Indoor Model Airplane Championships. Site: Pensacola. T. McLaughlan CD. 4140 Fern Ct., Pensacola, Fla. 32503.

June 9—Lancaster, ■■■. (A) F.O.R.K.S. RC Pylon Day. Site: Lancaster. J. Slater CD. 809 Forest Rose Ave., Lancaster, Ohio 43130. Sponsor: F.O.R.K.S.

June 9—Piscataway, N.J. S.A.M. Nats RC Warm-Up. Site: Middlesex County Model Airport. J. Clark CD. 1127 Denmark Rd., Plainfield, N.J. 07062. Sponsor: Central Jersey RC ■■■.

June 9—Durham, Conn. (A) Flying Aces Spring Meet. Site: Durham Meadows. D. Stott CD. 66 Bankside St., Bridgeport, Conn. 06606. Sponsor: Flying ■■■ Club.

June 9—Detroit, Mich. (AA) Cloudbusters, Inc. Annual CL Contest. Site: Rouge Park. A. Burczycki CD. 408 E. Brackenridge, Ferndale, Mich. 88220.

June 9—St. Charles, Mo. Spring RC Fly for Fun 1974 ■■■. ■■■ McDonnell ■■ Field. C. Bedoya CD. 1127 Ford Dr., Ferguson, Mo. 63135. Sponsor: McDonnell RC Club.

June 9—Philadelphia, Pa. (AA) Rangers RC Club Standoff Scale ■■■. Site: Phila. Navy Yard, W. Ayers CD. 712 Drexel Ave., Drexel Hill, Pa. 19026. Sponsor: Rangers RC Club.

June 9—Sioux Falls, S.D. (AA) Flying Eagles Spring CL Meet Site: Fairground, Sioux Falls. J Donovan CD. 1409 Thompson . Sioux Falls, S.D 57105 Sponsor Flying Eagles Model Club, Inc

June 9—Ellinwood, Kans. (AA) 2nd Annual CL and RC Continental Site Ellinwood. J Mowrey CD. Rte 2, Box 58, Kinsley, Kans 67547

June 9—Rice Lake, Wisc. (A) Hawks 2nd Annual Spring FF (Cat. II) Contest. Rice Lake F Kelley CD, 20 Phipps Ave Rice Lake, Wisc 54868. Sponsor Hardscrabble Hawks M A C

June 9—Ft. Lauderdale, Fla. Ft Lauderdale Ugly Stick Site. 16001 W. St. Rd Williamson CD 8300 NW 38th St. Coral Springs, Fla 33065 Sponsor Broward County RC Assn

June 9—Davenport, Ia. (AA) 17th Annual CL Model Site Davenport. R Norgard CD 2324 W 29th St. Davenport, Ia 52804 Sponsor Davenport M A C.

June 9—Salina, Kans. (A) SAFE Championships RC Meet Site City Airport D Moden CD 410 Hart, ns 67401 Sponsor Salina Accurate Flying Eagles

June 15—Salt City, Utah (A) June Combo Contest Site Salt Lake City G Swanson CD. 1420 Logan Ave. Salt Lake City, Utah 84105 Sponsor Utah State Aeromodelers, Inc

June 15—Memphis, Tenn. (AA) Propbusters Summer CL Bust Site McKellar Park L Goldsmith CD. 38 Northwood Dr., E. Memphis, Tenn 38111 Sponsor Memphis Prop Busters M.A.C

June 15—Omaha, Nebr. (A) M A S.S Monthly RC Soaring Meet Site The Grass J Simpson CD. 2636 Forbes Omaha Nebr. 68123

June 16—Plymouth, Mich. (A) Detroit Dual RC Meet Site. Plymouth D Corven CD. 32364 Gainsborough. Warren. Mich 48093 Sponsor Greater Detroit Soaring Hiking Soc

June 15-16—Somers, N.Y. (AA) Eastern RC Aerobatic Champs Site: Somers Sch Hall CD. 8 Seneca Rd., Danbury, Conn 06810

June 15-16—Mesquite, Tex. (AA) Dallas RC Club 10th Annual RC Pattern Meet. Site Samuels Park East D Brown CD. 930 Vine- st Ln., Richardson, Tex 75080 Sponsor Dallas RC Club

June 15-16—Winston-Salem, N.C. (AAA) Southeastern CL Model Airplane Championships Site Coliseum Parking Lot Pardue, Jr CD 1201 Surry Dr., Greensboro, N C 27408 Sponsor Golden Triad Model Masters

June 15-16—Dayton, Ohio (AA) Wright Brothers Memorial Annual RC Meet Site. Wright Patterson AFB Lowe CD. 3481 Clar Von Dr., Dayton, Ohio 45430 Sponsor Western Ohio RK Society

June 15-16—Langley A.F.B., Va. (AA) 10th Annual SEVRCG RC Championships Site Langley A F B Rich CD. 35 Harris Landing Rd., Hampton, Va 23669 Sponsor Southeastern Va RC Group

June 15-16—Denver, Colo. (AA) 16th Annual Mile-Hi Site Denver. H. Geller CD. 6920 E Exposition. Denver Colo 80222 Sponsor Mile-Hi RC Club

June 15-16—Pensacola, Fla. (AA) Pensacola Aero Modelers Annual RC Meet. Site Corry Field R Fritz CD. 1005 Revere Dr Pensacola, Fla 32505 Sponsor Pensacola Aero Modelers

June 15-16—Dallas, Tex. (AA) 6th Annual Sun and Fun FF Meet. Site. Dallas T Spanger CD. 2816 Dyer St. allas, Tex 75205 Sponsor Dallas Cliff Cloud Climbers

June 15-16—Huntsville, Ala. (AA) Southeastern RC Soar Nats Warm-Up Site Huntsville F Dais Jr CD 7409 Atwood Dr. Huntsville, 35802 Sponsor Rocket City Radio Controlers

June 15-16—Greenville, Maine (A) 3rd International Moose- RC Fun Fly Site Greenville Airport R Gibouleau Stillwater Ave., Orono, Maine 04473 Sponsor Eastern Maine RC Gulls

June 15—Lake Elsinore, Calif. (A) SCIF-SCAMPS R O W Meet Site Lake Elsinore R. Brickner CD 4239 Continela Ave Los Angeles Calif 90066 Sponsor Southern California Ignition Flyers

June 15—Portland, Ind. (A) COFF Annual FF Meet Site Portland L Willis CD, 1006 E 12th Columbus, Ohio 43211 Sponsor Central Ohio Free Flight

June 15—Westboro, Mass. (A) NERCM Fun Fly Site Lyman School W Army CD. 15 Rhodes St Millbury Mass 01527 Sponsor New England RC Modelers

June 16—Urbana, Ill. (A) Aeronauts 12th Annual CL Meet Site Illini Airport J Lewis CD. 191 Hindsboro, Ill 61930 Sponsor Champaign-Urbana Aeronauts

June 16—Detroit, Mich. (AA) Great Lakes International RC Meet Site: Rouge Park A Adamisin CD. 22454 Fairfax. Taylor, Mich 48180 Sponsor Strathmoor Model Club of Detroit

June 16—Springfield, Mo. (AA) Spring Bust CL Meet Site. Meador Park Pfeifer CD. Rt 8, Box 176-A Rogersville, Mo 65740 Sponsor Springfield Balsa Busters

June 16—Milwaukee, (AA) Circlemasters of Milwaukee CL Meet Site: Northridge Shopping Center E Boase CD. 3808 N 97th Pl., Milwaukee, Wisc 53222 Sponsor Circlemasters of Milwaukee

June 16—Jamestown, N.Y. (AA) United Pylon Racing Circuit RC Meet. Site: Jamestown E Landefeld CD, RD #2, 11151 Jamison Rd., E Aurora, N.Y. 14052

June 16—Nassau, N.Y. (A) Long Island Drone Society 4th Annual RC Pylon Meet Site: Mitchell Field W Fupp 26 Fernwood Dr., Commack, N Y 11725 Sponsor Long Island Drone Society

June 16—Chicago, Ill (A) Sport Pattern Biplane Contest. Site S A C Field G Nelson CD. 23 Marie Dr. Downers Grove, Ill 60515 Sponsor Suburban Aero Club

June 16—Lake Elsinore, Calif. (A) 5th Annual R O W Scale FF Meet Site: Lake Elsinore C Hatrak CD. 3825 W 144th St., Hawthorne, Calif 90250 Sponsor Rockwell International Flightmasters

June 16—Glastonbury, Conn. (A) SAM-7 Summer Outing Site. Meadow Road T Lucas CD. 19 Burke Rd., Rockville, Conn 06066 Sponsor Society of Antique Modelers Chapter 7

June 16—Plymouth, Mich. (A) SOAR Dual RC Site Plymouth Field Liptak CD. 325 O'Neil St Joliet, Ill Sponsor Society of Aeromodeling by Radio

June 16—Memphis, Tenn. (AA) Memphis CL Meet. Site. McKellar Park E Annstone, Jr CD. 5072 Hampshire Ave., Memphis, Tenn 38117 Sponsor Memphis Society of Modeling, Inc

June 16—Council Bluffs, Iowa (AA) 11th Annual Midwest CL Model Meet. Site. Iowa School for Deaf Hough CD. 924 Avenue I, Council Bluffs, Iowa 51501.

June 16—Canoga Park, Calif. (A) San Fernando Valley Silent Fliers Bi-Monthly RC Meet Site. Pierce College. J. Timlin, III CD. 10539 Hillview Ave., Chatsworth, Calif. Sponsor San Fernando Valley Silent Fliers.

June 22—Mowsaqua, (A) Blunderbirds RC Thermal Soaring Contest. Site. Kroenleins Airport. D. Holtfreter CD. P O Box 366, Blue Mound, Ill. 62513 Sponsor: Decatur Blunderbirds.

June 22—Hillsboro, Ore. (AA) Nor Westers FF Annual. Site Hillsboro D Sobala CD. 1720 NW 138th Ave. Portland, Ore. 97229 Sponsor Nor Westers

June 22-23—Weston, W.Va. (A) National RC Fun Fly Championships Site: Jacksons Mill S Sturm CD. Box 4153, Vienna, W Va 26105 Sponsor Mountaineer Aero Modeling Club & Clarksburg Aviation

June 22-23—Longview, Texas (AA) N E Texas FF & CL Championships Site Pine Tree H S T Southern CD. 2207 Paul, Longview, Tex

June 22-23—Winter Park, Fla. (A) Great Florida Bi-Plane RC Championships Site: R C A C F Field W Schoonard CD. Sharon Dr. Winter Park, Fla 32789

June 22-23—Courtland, Ala. (AA) Decatur M.A.C. 8th Annual RC Meet Site. Courtland Air Base J Ray CD. 1304 Fletcher Ave SW. Decatur Ala 35601 Sponsor Decatur M.A.C.

June 22-23—Columbia, (AA) Mid-Missouri RC Assn's 2nd RC Contest Site Columbia Albright 1014 Bellevue Ct Jefferson City, Mo 65101 Sponsor Mid-Missouri RC Assn

June 22-23—Newark, Calif. (AA) Standoff Scale Invitational Site Willow Avenue R Franco CD. 4868 Mauna Pl Fremont, Calif 94538 Sponsor Southern Alameda County Radio Controllers

June 22-23—Spokane, Wash. (AA) Expo '74 RC Miniature Aircraft Competition Site Fairchild AFB G Horstman CD. E11223 LaCrosse, Spokane Wash 99206 Sponsor Barons Model Club

June 22-23—Osseo, Minn (AAA) 1974 Lakes CL Championships Site Hennepin Community College J CD. 7525 N 59th Pl Minneapolis, Minn 55428

June 22-23—Melbourne, Fla. (AA) Third Fingercrackers CL Championships Site Brevard Jai Alai Ross 1700 Pontiac Cir S. Melbourne, Fla 32935 Sponsor Fingercrackers M A C

June 22-23—Tulsa, Okla. (AA) 25th Annual Tulsa Glue Dobbers RC Meet Site Local J CD. 5019 S Joplin Ave Tulsa Okla 74135 Sponsor Tulsa Glue Dobbers.

June 22-23—Dahlgren, (AA) DC/RC Annual Aerobatic Meet Site Dahlgren Naval Weapons Laboratory T Carey CD 17900 Cliffbourne Ln Derwood, Md Sponsor DC/RC Inc

June 22-23—Casco, Mich. RC Championships Site RCCD Field Mottin CD 2124 Common Rd., Warren, Mich Sponsor RC Club of Detroit

June 23—Benton Harbor, Mich. (A) Whirlwinds 3rd Annual RC Glider Meet Site Benton R Scher CD Box 10, 604 John Beers Stevensville Mich Sponsor Whirlwinds of Southwest Michigan

June 23—Washington, D.C. (AAA) S L O W Summer 2nd Annual CL Spectacular Site Anacostia NAS M Streeter CD. 8512 University Blvd Silver Spring, Md 20903 Sponsor Sky Lancers of Washington

June 23—Warrensville, Ohio (AA) 1st Annual Cleveland Club Pattern Contest Site Harvard & Rds A Bumpus CD. 1819 Cleveland, Ohio 44112 Sponsor Cleveland RC Club

June 23—Chagrin Falls, Ohio (A) 3rd Annual Great Lakes Rubber Scale Meet Site Savage Road C Reichel CD. 3301 Cindy Ln., Erie, Penn 16506 Sponsor Erie Model Aircraft Assn

June 23—Cleveland, Ohio (AA) Flitemasters CL Rally Site Cleveland G Baker 4023 Victory Ohio 44135

June 23—Maywood, Ill (A) RC Pylon Race Site Maywood R Piorek CD 823 Lombard Ave Oak Park, Ill 60302 Sponsor Checkerboard RC Chicago Pylon

June 23—Easton, Penna Lehigh Valley R C S RC Contest Site Bradens Airport D CD. 3831 Mechanicsville Rd., Allentown, Penna 18052 Sponsor Lehigh Valley R C S

June 23—Ft.Worth, Tex. (A) Formula I RC Pylon Race Site Ft Worth Slaughter CD. 2202 Jacocks Ln. Ft Worth Tex 76115

June 23—Sepulveda, Calif (A) San Monthly June '74 FF (Cat. II) Meet Site Sepulveda L Sindelar CD 5238 San Fernando Rd A Glendale Calif 91203 Sponsor San Valleers M A C

June 23—Hadley, Mass Grand Prix RC Air Races Site Hampshire Co RC ers Dean CD. 19 Kelleher S. Deerfield, Mass. 01373 Sponsor Hampshire County Radio Controllers

June 23—Livingston, N.J. (AA) Third Annual Flying Tigers Air Meet Site G-V Controls C Schaefer CD. 514 Chestnut St Westfield N.J 07090 Sponsor Livingston Flying Tigers

June 23—Sacramento, Calif. (A) N C F F C 4th FF Meet—Team Contest Site Waegell Field W Vanderbeek 459 Woodcock Ct. Milpitas, Calif 95035 Sponsor 900 Club

June 23—Houston, Tex. (AA) MSC-RCC 3rd Annual Soaring Contest Site NASA-JSC O Morris CD. 130 Driftwood, Seabrook, Tex 77586 Sponsor MSC-RCC

June 23—Mowsaqua, (A) Blunderbirds RC Thermal Soaring Contest Kroenleins Airport D Holtfreter CD P O Box 366, Blue Mound, Ill 62513 Sponsor Decatur Blunderbirds

June 23—Detroit, Mich (AA) Great Lakes International CL Meet Site Rouge A Adamisin CD. 22454 Fairfax Taylor, Mich 48180. Sponsor Strathmoor Model Club of Detroit

June 23—Henrico County, Va Curles Neck 2nd Annual Fun Fly Site Curles Neck Dairy Farm. J Novak CD. P O Box 539, Chester Va 23831 Sponsor Curles Neck FF Soaring Society

June 23—Franklinville, N.J. (A) Pre-SAM Nats RC O.T. Warm-Up Site Franklinville D Lemon CD Box 599 Coles Mill Franklinville, 08322 Sponsor Clayton Club

June 23—Hamburg, N.Y. 1st Annual "Wrongway Corrigan Grand Prix Site Hamburg K Landefeld CD 11151 Jamison Rd Aurora, N Y 14052 Sponsor RC Aircrafters, Inc

June 23—Cody, Wyoming (AA) Cody RC Glider Meet Site Cody W Higgins CD. 305 Day, Powell Wyoming Sponsor Wyoming Sagebrush Hoppers.

June 23—Rockford, Ill. (AA) Rockford Aeromodelers Annual CL Contest Site Riverdahl Airport X Johnson CD 1818 Oslo , Rockford, Ill 108. Sponsor Rockford Aeromodelers

June 29—Dayton, Ohio (A) 1st Annual DARTS RC Soaring Competition #1 Site Municipal Field L Gleason CD. 108 Cushing Ave Kettering, Ohio 45429. Sponsor Dayton Area Thermal Soarers

June 29—Brockport, N.Y. (A) Quarter Midget Races Site Brockport R Walder CD. 27 Folkside Ln., Fairport, N.Y 14450 Sponsor RC Club of Rochester, Inc

June 29-30—Wichita, Kans. (AA) Annual Midwest RC Championships Site 13th & Webb Rd J Finley CD. E Central, Wichita, Kans 67206 Sponsor Wichita RC Club

June 29-30—Knoxville, Tenn. (AA) Knox County RC AA Pattern Contest Site KCRC Field R Rhyne CD. Rt. 8, Clinton, Tenn 37716 Sponsor. Knox County RC Society, Inc.

June 29-30—Elk Grove Village, Ill. (AA) Skylarks RC Pylon Races Site Chicagoland D Gauer CD. 832C Colonial Dr., Wheeling, Ill 60090 Sponsor Skylarks RC Club

June 29-30—Syracuse, N.Y. (AA) Syracuse A.R.C.S. 3rd Annual RC Pattern Meet Site: Syracuse, W. Throne CD. 206 Windemere Rd., Syracuse N Y 13219 Sponsor. Aero Radio Club of Syracuse

June 29-30—Valley Forge, Penna. (A) Third Annual Valley Forge Scale Classic Valley Forge State Park N. Evans CD, 970 Steven Ln., Wayne, Penn 19087 Sponsor Valley Forge Signal Seekers

June 29-30—Lima, Ohio (AA) LARKS 1st Annual RC Pattern & Standoff Scale Meet Site: Bath Twp House Rt 81 G. Lucks CD, 970 Bible Ave., Lima, Ohio 45805 Sponsor Lima Area Radio Kontrol Society

June 30—Rochester, N.Y. AA) United Pylon Racing Association Meet Site Rochester Walder CD 27 Folkside Ln Fairport, N Y Sponsor Radio Control Club of Rochester, Inc

June 30—Bridgewater, Conn. (AA) Summer '74 FF Meet Site. Correctional Institution Colson 47 Sammet St., Everett, 02149 Sponsor: New England Wakefield Group.

June 30—Muscatine, Iowa (AA) 5th Annual CL Contest Site. Muscatine Plaza K Morris CD. 404 Park Ave., Muscatine Iowa 52761 Sponsor Muscatine Miniature Aircraft Assn

June 30—Warminster, Penn. (AA) D V F M.A.C FF (Cat. II) Fling Site: Warminster Naval Air Facility T Kerr CD, 7824 Lexington Ave., Philadelphia, Penna 19152 Sponsor Philadelphia Sky Pirates

June 30—Dayton, (A) 1st Annual DARTS RC Soaring Competition #2. Site. Municipal Field. W Pinnell CD. 2474 Bengon Dr Dayton, Ohio 45431 Sponsor: Dayton Area Thermal Soarers

June 30—Fresno, Calif. (A) FGMAC Monthly FF (Cat I) Meet Site Fresno F Ginder, Jr CD. 5740 E Ashlan Fresno Calif 93727 Sponsor Fresno Gas Model Club

June 30—Muncie, Ind. (B) Season Opener for CL Site Westside Park A Goff, Jr CD E 12th St., Muncie, Ind. 47302 Sponsor: Muncie Controlmers

June 30—Texas City, Tex. Texas City Summer Fun Fly Site Texas City Remmler CD. 407 Biscayne Blvd., Seabrook, Tex. 77586 Sponsor Texas City RC Club

June 30—Sioux Falls, S.D. Sioux Falls RC'ers Fun Fly Site: Modelport West J Donovan CD. 1408 Thompson Dr., Sioux Falls, S D 57105 Sponsor Sioux Falls RC'ers.

June 30—Valkaria, Fla. (A) Valkaria RC Meet. Valkaria Airport Williamson CD. 8300 NW 38th St., Coral Springs, Fla. 33065 Sponsor Indian River Kontrol Soc

June 30—Troy, Ohio (A) Sky Bugs 1st Annual CL Combat Meet Site Club Field J Fesenmaur CD. 4048 Old Salem Rd., Englewood, Ohio 45322 Sponsor Troy Sky Bugs

June 30—Valley Park, Mo. (AA) Gateway CL Combat Championships Site Buder Park G Frost CD. 22 Glynn Dr., Florissant, Mo 63031 Sponsor Hot Heads MAC

June 30—Michigan (AA) Lansing Flying Aces FF Meet Site Not determined G Schautz CD. 9283 Brooks Rd., Lennon, Mich

July 1-7—Lakehurst, N.J. (AAAA) AeroOlympics World Championships for CL & Scale and Indoor; Limited International Contests for RC Pylon Racing and Soaring, Old Timers Nationals, open Indoor Site Lakehurst Naval Air Station Sponsored by Academy of Model Aeronautics, 806 Fifteenth St., N.W., Washington, D.C. 20005

July 2-4—Lakehurst, N.J. (A) Society of Antique Modelers Championships Lakehurst N A S Woodman CD. 389 Floral Ln., Saddle Brook, N.J. 07662. Sponsor Old Time Eagles MAC

July 4—Fort , Md. 3rd Annual 4th of July Fun Fly for RC Site Range #5. Fort Meade W Cielo CD. 575 Rita Dr., Odenton, Md 21113 Sponsor Fort Meade Modelers MAC

July 4—Ladue, Mo. Fourth of July Air Show Demonstration/Entertainment Flying Activity Site St Louis Country Club W. Feldmeier CD. 2865 Clearview Normandy Mo 63121

July 8—Chagrin Falls, Ohio (AA) Second Annual FF Rubber & Jetex Meet Site Chagrin Falls L Campbell CD. 9230 Independence, Parma Hgts Ohio 44130 Sponsor Cleveland FF Society

July 6-7—Ft. Walton Beach, Fla. (AA) Jim Kirkland Memorial RC Contest Site Eglin Air Force Base, Auxiliary Field #4. R McGraw 43 Waynel Cir., Ft. Walton Bch., Fla 32548 Sponsor Eglin Aero Modellers

July 6-7—Omaha, Nebr. (AA) National Multiwing RC Championships Site Omaha O Olson CD. 6111 Maple St., Omaha, Nebr 68104

July 6-7—Medras, Ore. 6th Annual N W Seaplane Championships Site Haystack Reservoir J Holcomb CD. 1010 NE 122 Ave., Vancouver, Wash 98664 Sponsor Portland Sky Knights

July 6-7—Geneva, NY (A) N Y S 3rd Annual RC Fun Fly Championship Site Geneva D Bowalman CD. 72 Buffalo St., Canandaigua, NY 14424 Sponsor Sky Rovers Flying Club, Inc.

July 6-7—Lexington, Ky (AAA) Mid-America Championships for CL Site Kearney L McFarland CD. PO Box 8177, Lexington, Ky 40503 Sponsor Lexington MAC

July 6-7—Springfield, (AA) Springfield RC Club 4th Annual AMA Contest Site SRC Flying Site G Langston CD. PO Box 985, Springfield, Mo 65801 Sponsor: Springfield RC Club

July 6-7—Pattyville, W.Va. (AA) Vienna Skysharks Annual RC Contest Site Club Field S Sturm CD, Box 5234, Vienna, W.Va. 26105 Sponsor Vienna Skysharks MAC, Inc.

July 6-7—Lexington, S.C. Larks Annual Fun Fly. Site. Lexington J Scharpf, Jr CD, Rt 7, Box 271E, Lexington, S C 29072. Sponsor. Lexington Aircraft RC Society.

July 7—W. Suffield, Conn. (A) Nor'East Races '74 for RC Site NCRCC Field A Simmonds CD. 145 Irene Dr., RFD #4, Vernon, Conn 06066 Sponsor Northern Conn. RC Club.

July 7—Ft. Lewis, Wash. (A) Washington-Oregon Old Timer Championships Site Harts Lake Prairie Dodd CD. 10848 32nd Ave., SW. Seattle, 98146 Sponsor. Boeing Charter Hawks

July 7—Riverdale, Ill. (AA) Chicago Model Masters CL Annual Kickapoo M Booker CD. 15711 Dixie Hwy., Harvey, Ill 60426

July 7—Mentor, Ohio (A) M.A.R.C.S. Firecracker RC Classic. Site Tyler Blvd. R Mellen CD. 4729 Orchard Rd., Mentor, Ohio 44060. Sponsor Mentor Area RC Society

AMA OFFICER DIRECTORY

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GLOWDRIVER

(Continued from page 61)

If the circuit has volts on it, and the bulb still will not light, check the potentials between base and emitter of transistors X2, X3, X4, and the pair X5 and X6. If any base-emitter potential is much bigger than .6 volts, replace the transistor. Likewise, the Zener should have four volts across it, and the 1K resistor less than one volt. If the resistor has much more than this, disconnect X11 from X2, or remove X11. If the bulb now lights, the trouble is with X11 or the circuit that runs it. See if the potentials in the circuit match those ■ the diagram. If they do, X11 is shorted and should be replaced. If they are wrong, find out why. The circuit is simple enough, so it is not hard to run down the faulty component.

If the light lights like ■ photoflood, X7 is probably dead or miswired. If the wiring is right, yet the collector potential is about 12 volts, replace X7 and all should be well. If the light sings, but lights brightly and cannot be turned down by the temperature control, there is trouble with the bridge, with X8 or with X9. Voltage measurements do not help much here, so check the wiring, and if you do not find the cause there, replace the transistors.

If the bulb flares up briefly as it is connected and disconnected, the anti-multipluse circuit is not working. Check the potentials on X11. If they are wrong, find the bad component in the diode pump (C4, D6 and D7). If, when the glow plug connector is short circuited, it makes a heavy buzz, rather than ■ slow "tick-tick-tick," verify that the anti-multipulse feedback is working. If it is, then X11 is good, so the trouble must be in X10, or diode D4, or (less likely) capacitor C8.

If these procedures do not find the trouble, something mysterious is happening, and you need a friend with an oscilloscope. The surest procedure is then to lift the collector of X11 from the base of X2 and connect it to the positive buss, via ■ 1K resistor. Also, lift the collector of X9 from the base of X7 and connect it to the negative buss, via a 39 ohm resistor. This isolates the temperature control feedback, the anti-multipulse and anti-short circuit feedbacks from the multivibrator. We can now examine the feedback signals. A further trick is to insert a 3.3 ohm resistor between the collector of X3 and the positive buss. The signal across this resistor should start at about 1.5 volts, implying .5 ampere of the drive current through the Zener to X4. This will fall with time, as the current pulse proceeds.

If you are an experimenter at heart, build Glowdriver on a breadboard. It takes an evening, if you are not fussy about appearance. For a rugged, professional looking job, read the next article, where Hobie Steele tells how to make it ■ a printed circuit.

SUDDEN SERVICE PLANS
CHECK PAGE 86

LISTER ON L/D=

(Continued from page 62)

Let's look at the four sections, and see if there are any qualities that may set some apart from the others. Just based upon geometry, the E374/Mod 4.0, 10.0, and the E387/Mod 4.0, 10.0 both have bottoms that are within 1/32" of being perfectly flat behind the 15% chord point (on a chord of 8"). Frankly, I think that you could neglect the slight undercamber on these two and make them flat from the 15% station to the TE. The NACA 4410 and the E385/Mod 4.0, 10.0 both have noticeable camber, which probably shouldn't be neglected.

Aerodynamically, it's very difficult to pick one as being better than another. If there's any effect at all, I would expect that the best all-around section is the E387/Mod 4.0, 10.0. For the guy who doesn't intend to ever do anything on a windy day, the NACA 4410, or E385/Mod 4.0, 10.0, might be the choices. If you do anticipate flying on windy days with a little more ballast, go with the E374/Mod 4.0, 10.0 section. The differences in section drag, over a broad range of flying conditions should be almost unnoticeable. But, since you'll have to pick, the above insights might help a little.

Use them in good health and have fun. Build a fun flyer.

STOCKWELL ON RC

(Continued from page 63)

If the sport gets the needed transfusion in the Northwest, then we will have to agree that Bob Root is right, and the other districts will have to follow his lead. If not, we will assume that speed is not the bugaboo that some people think it is, and that the real problem lies somewhere else—expense, preference for a less pressured kind of competition, lack of decent flying sites for aircraft that land hot (regardless of idle), or whatever.

At Whittier Narrows, there was experimentation with a possible solution to another perennial problem of Formula 1. First, we gave up the old handicapping system last year and went to judging aircraft in four groups, with flip of the coin deciding starting order between two planes that had identical handicapping points. But that still seemed unfair, when the competition is so closely matched that starting order more often than not determines order of finish. (Bob Violett would have won the NMPRA Championship Race last Thanksgiving without a fly-off, if he had not started second to Bob Smith in one heat. Both flew letter-perfect courses, and Smith beat him by exactly the starting differential.)

So, at Whittier, planes with identical handicaps took off simultaneously. There was not a single collision on the takeoff, until the fly-off for second in Standard Class (Jerry Silverman, NMPRA V.P. for the So. Cal. District, had won first place on points), and there were no collisions among the experts. Given that highly successful experiment, it is quite likely to be tried again.

SMITH ON CL

(Continued from page 64)

Another idea, this from talking to some other C fliers, would be to eliminate pipes for C, allowing only an "extractor" of three-in. maximum length. One last suggestion: raise the pull test for C to 50 Gs. Right now we are flying within 2-3% of the 40 G pull. Putting the pull test at 50 Gs would give C a much larger margin of safety. Everybody I talked to felt that the model/line/handle will take the added pull test (these are models they are flying today).

Only for Junior contestants would there be a ban on all pipes in all classes. The three-in. "extractor" would be permitted. Possibly putting A back on 52.5-ft. wire, and keeping B on 60-ft. would be OK. For many Juniors, it will be a real chore to get a slower moving airplane off the deck on the longer 60-ft. or 70-ft. lines without having the airplane "eat" them as it torques across the circle.

There has been talk of making everyone make their own pull test; in other words, if you can't pull it, you can't fly it. This sounds good at first, but I know a great number of Junior fliers who have no problem handling

the airplane at top speed, but who grunt their guts out trying to pull the required pull test weights. For that matter, there are a few Open guys who have this problem, so this idea should be looked at closely.

The last suggestion is for the CLCB to vote again on the proposal to allow proxy fliers in Open class. Why this proposal was voted down is one of the mysteries of the century. Everybody (fliers) wanted it, but again it was defeated. This re-vote could be put through as an emergency measure, and would do a great deal of good, if passed.

If any of the above proposals (suggestions) raise your interest pro or con, drop me a note or call me and your "vote" will be entered. My home phone is (216) 833-0789. The address is 960 Brenner Ave., N.W., Massillon, Ohio 44646. Let me hear from you. Just don't call collect, my interest in Ma Bell is just too high as it is.

MCCULLOUGH ON RC

(Continued from page 69)

With most styles of mufflers, this is hard to do. JCM Specialties make a 90° elbow fitting for their Airfoil mufflers, a combination capable of being enclosed in nearly any cowl that will cover the engine. The accompanying photo shows it on a Veco 61, which is to be installed in my Steen Skybolt, designed for Jerry Nelson's biplane stunt event. The rules for this new competition class require a muffler and, since the entries are Sport Scale, the cowlings are not too large on airplanes of around 50" average wingspan. But the JCM fits easily.

One precaution is absolutely necessary when discharging the exhaust within the cowl. There must be internal baffling, to keep the hot gases from mixing with incoming cool air. Not only would the engine probably overheat without it, but the swirling airstream inside an unbaffled cowling is sure to carry exhaust into the carburetor, especially a rear rotor. Bob Karlsson's troubles with his Corsair at the 1972 Nationals were largely due to this problem.

Shim stock baffles and ducts make cowled engines happy. McCullough's Shinn 2150 was saved from engine failures by proper air ducting.

The ideal method is to cut off all air going through the front of the cowl except for a tunnel going past the carb opening (on a front rotor engine) and through the head fins. For a rear rotor, a separate air tunnel to feed cool air is necessary, as pylon racers have discovered. After the only incoming air has been ducted past the fins, it can be discharged into the remaining cowl space to mix with the exhaust.

It is best to have an exit outlet that is larger than the inlet, for a suction effect—another good reason for keeping the incoming air opening as large as necessary. If you think a large opening is required for proper cooling, take a look at a CL speed model. These high revving engine burners get by with a mere slit, because all of the air entering is directed to the place where it will do the most good.

A dummy engine is a good way to block off parts of the cowl in which openings are not needed. My Shinn 2150 had overheating problems on every flight at the '72 NATS, aborting most of them. A complete rework of the whole cowl was first priority for '73. A dummy Lycoming closed the cowling port, opposite the side mounted Webra, completely. A cooling tunnel was made from brass shim stock and bolted to the motor itself, so that every bit of air that came over the top of the dummy engine cylinders in front went through the fins. The tunnel interior and engine head were painted flat black so that they did not detract from the appearance of the dummy cylinders in front. These modifications completely cured the overheating.

MOONEY ON FF

(Continued from page 72)

mon sizes of balsa, they are also cutting special Peanut sizes. These are: 1/20" sq. @ 3 cents; 1/20 x 3/32" @ 4 cents; 1/20 x 1/8" @ 4 cents. All of the above in 18" lengths. They also cut 1/20 x 2 x 36" sheets @ 40 cents. The wood is graded; red end is light, and black end is medium to medium hard. They claim their balsa is superb, with no windchecks, no wormholes, and no angle grain. What I've seen is good stuff, and just right for Peanut-sized models.

MARKS ON TECHNIQUES

(Continued from page 72)

"Do you know how to reverse servo travel? I know of two ways to do it. The first involves reversing the end wires of the pot coupled to the transmitter control stick. The second method involves the servo, and requires the reversal of the motor wires and the wires at the feedback pot (not the wiper wire). In both cases, the servos may need to be recentered.

"If the change was made in the transmitter, the pot that was changed may have to be rotated to recenter the servo. If the change was made in the servo, the servo itself may need recentering by whatever means is suggested by the manufacturer. Bear in mind that changing the wires in either the transmitter or servo may void your warranty."

The above is the case for all servos that use three wires to the feedback pot, and transmitters that use three wires to the control pot. All servos that use the World Engines

servo tC just two wires to the feedback pot. Our own AAM Commander transmitter uses only two wires to the control pots. In both instances, it is only necessary to transfer the end terminal pot wire to the other end terminal. Don't change the center terminal lead.

From The *Monmouth Model Airplane Club Newsletter:* "I was first exposed to fiberglass fuselage construction when I built my Huey Cobra helicopter in the spring of 1971. Since that time, I have been on the lookout for an epoxy-type cement that does not run (thixotropic). I finally found a source that sells this type of cement in a squeeze tube package for $2.75. The cement goes by the trade name Eccobond 286 and can be purchased, in lots of six packages, from Emerson and Cuming, Inc., Canton, Mass. 02021. They also sell a truly thixotropic cement, Eccobond 787, that does not run at all, but it can only be purchased in two-lb. quantities, for $11.50. I have tried samples of both, with excellent results."

And One of Our Own: As far as we're concerned, the only quick, easy way to cut heavy music wire is to the Dremel Moto tool, with No. 409 abrasive discs. A clean, smooth cut through 3/16" wire be made in about 30-45 seconds. Wear protective eye gear, since these abrasive wafers do shatter.

POLING ON ELEC. FLIGHT

(Continued from page 73)

Parts and Supplies: Bob Meuser suggests that volt and ammeters available at reasonable prices from model railroad catalogs. He also found that the Sears motor, for their cordless grass shear, looks like a good possibility for electric flight. The shear model # 240-86810; the motor number is 3924.

Mail order businesses have a variety of items useful for the electric flier. The following companies sell meters, nickel-cadmium batteries, and many other items at reasonable prices: Olson Electronics, 260 S. Forge St., Akron, Ohio 44327; Electronic Distributors, Inc., 4900 N. Elston Avenue, Chicago, Ill. 60630; B&F Enterprises, 119 Foster St., Peabody, Mass. 01960.

B&F sells an amazing variety of surplus items, EDI sells the GE Permacell line, and Olson has quite prompt delivery. J.C. Whitney & Co., 1917 Archer Ave., P.O. Box 8410, Chicago, Ill. 60680, windshield washers (motors are useful), motorcycle batteries, and an ammeter (Model T Ford) for $1.35!

All You Wanted To Know About Nickel-Cadmium Batteries: General Electric publishes an Application Engineering Handbook, Publication Number GET-3148, which is explicit, informative, and honest evaluation of nickel-cadmium batteries as I have read. I recommend it; write: General Electric Company, Battery Products Section, P.O. Box 114, Gainesville, Florida 32601.

Electrics in Oklahoma: My Electra Fli has taken its first test flight. The power available is impressive—a more complete report will follow next month. The Dick's Dream electric is

Detail shot of the Dick's Dream electric conversion, using a Plymouth washer motor.

on the increase, another flier here has one ready for flying. The photo shows the installation in the Dream.

BURKHAM ON HELICOPTERS

(Continued from page 73)

the rank beginner."

Hurray for Dave! Go thou and do likewise!

Dieter Schluter's new Gazelle SA 341 on floats. The model did not have ducted fan tail rotor ("fenestron") of the prototype.

Special Treatment: A newsletter from the Mentor Area Radio Control Society indicates that they have a special section for helicopter pilots, with a chopper chairman and even a helipad at their flying field. This is a good idea, since helicopters and airplanes don't mix very well. Thus, if there aren't enough chopper hoppers to form their own club, they can share the benefits and responsibilities of an existing organization.

Kalt Hueycobra: If you have a Kalt Hueycobra which rolls off to the right in forward flight, Dave Keats suggests lengthening the servo paddles by 50%. Roughen the ends of the present ones, epoxy on balsa extensions, carve and sand to match the shape of the existing ones and cover with contact paper. Also spring load the main rotor teetering hinge. If you have one of the early free-teetering ones. warns: "Be careful on first few flights as the main rotor will more sensitive and control very positive." Dave also suggests adding

an aluminum trim tab, about 1½ x 3" to the vertical fin and bending [redacted] slightly for a left turn.

The rotor head of the Katt Bell 212. Collective mixing lever on top.

Blades While-U-Wait: If you don't like the airfoil or the material of your kit-furnished blades, or if you [redacted] many replacement blades, Earl Kralovec, 1809 N. Locust St., Appleton, Wisc. 54911, will build blades to your exact specification and wood requirements. These are ready for light sanding and covering, and sell at $8.00 per pair (quantity discounts available). Merely furnish him [redacted] sample blade section, full-size, rather than [redacted] drawing or [redacted] set of coordinates. Fancy laminations, anything more involved than a simple hardwood leading edge and balsa trailing edge, [redacted] possible, but cost more.

Where the Action Is columns are what you readers are doing, making, or flying. Support your columnist with articles, photos, and ideas. Sketch your neat gadget. We'll draft it for presentation. Each item earns you a $5 bill. Submit to the writer, c/o AAM.

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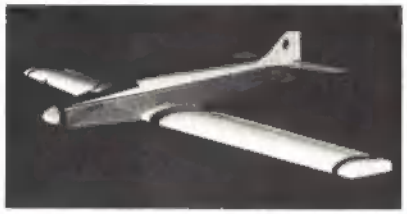

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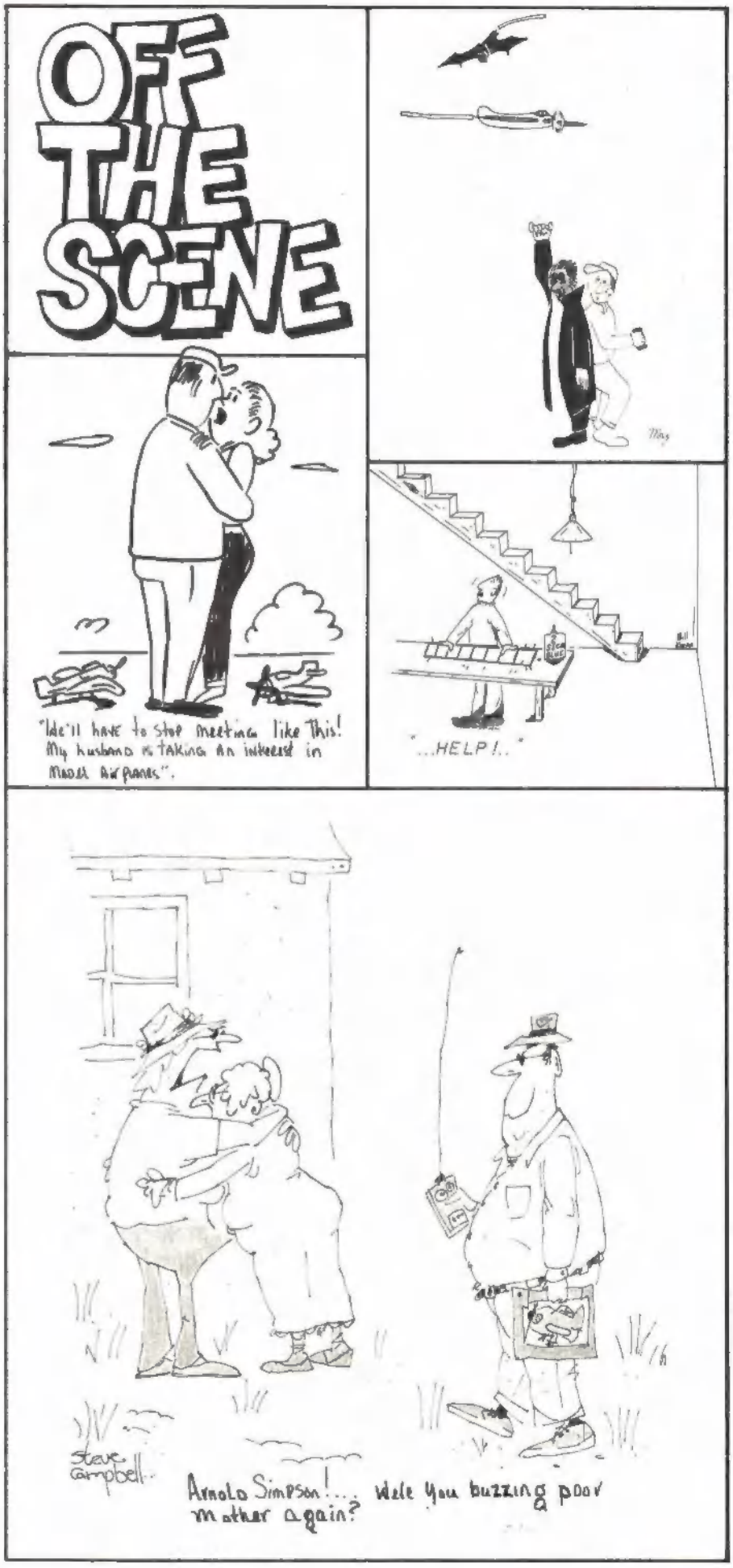

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